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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

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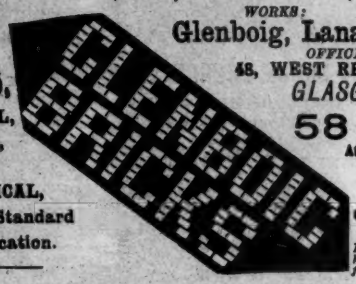

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VOL. CLXXI., No. 3252.] WEDNESDAY, SEPTEMBER 9, 1925. [77TH YEAR.

EDITORIAL NOTES.

High Service Standards at Dunfermline.

THE members of the North British Association of Gas Managers visited Dunfermline—the scene of the daily activities of their President (Mr. James Campbell)—for their annual meeting last Thursday. Right royally were they received; and their enjoyment throughout was on a corresponding plane. Our report of the proceedings and of the attendant events shows this. The technical work of the occasion, however, claims consideration here. The Presidential Address alone could have "filled the bill" for a day's meeting; for it was composed of instructive and discussable material of large importance in these days, when economical operation and good service to the public stand for so much in the efficiency of the work of a gas undertaking. Mr. Campbell eschewed matters of political moment, and confined himself, excepting in one particular, to questions of practical importance.

The single exception was his reference to the Government scheme for the development of the electricity industry, through and by which it appears special aid is to be given to the competing industry, and this (so it has recently transpired) is to be effected by the appropriation of the surplus of the Road Fund, amounting to about £16,000,000. The whole scheme is based upon a misconception as to its national value; but it is very difficult to get a Government to confess in a matter of this kind, when they have committed themselves so far, that it is nothing but a mirage that has been luring them along. But even Governments are not insensible to public opinion; and in addition to the objections of motorists to a fund being raided that has been built-up by their taxation for a specific purpose, and with the obligation attached that it shall be devoted to the purpose, and that alone, it is the duty of every gas man to assist in the creation of public opinion by utilizing every occasion for obtaining publicity respecting the matter. Mr. Campbell availed himself of the opportunity afforded by his Presidential Address to refer to the subject; and thereby no doubt he has secured for what he had to say an extended publicity in the newspapers of Scotland. He acknowledged the brilliant advocacy and lead which Mr. D. Milne Watson has given in this regard; and never was recognition more thoroughly deserved. The President dipped into the addresses which Mr. Milne Watson has delivered on the question; and, in four or five short paragraphs, showed how shallow are the foundations of the case for Government assistance to the electricity industry, and for the hopes that have been inspired by imperfect knowledge. The Government would show their strength to better advantage by, instead of pursuing the intangible benefits of the electricity scheme, having (as suggested last week) the power and heat problem thoroughly explored as a supplement to the coal inquiry. The very fact that they did not urge the electricity scheme forward this year—for no doubt very good reasons—is an indication that they now recognize the matter is not pressing. The period of delay has another advantage; and it is that it gives time for the creation of public opinion on the subject. It is especially important that local authorities should be interested in the matter. The President agrees with this, and he appeals to the municipalities of Scotland to take concerted action to bring before members of Parliament their views regarding the mistaken policy of the Government.

There is every reason why the Government should not do anything which will interfere with the development of an industry which is carrying on a great public service with an efficiency which has largely increased in latter years, as reflected in the considerable augmentation of public patronage. The progress of the gas industry during recent years has beaten its own previous records. Dunfermline has shared in that progress, with the result that since 1918 the output of gas has advanced from 205 million c.ft. to 355½ million c.ft., or by 73·4 p.ct. This has caused Mr. Campbell to make a study of the course of events, and a curve which he presents conveys several interesting lessons. He sets these out. There is, in the first place, the importance of the lighting load; and this is accentuated by a comparison of the outputs between the hours of 6 p.m. to 10 p.m. and other periods of the day. Then there is the extent to which gas is used for cooking; each meal time having its distinctive peak. The next noted factor is that the maximum hourly output in Dunfermline now occurs in summer, and is equal to upwards of 12 p.ct. of the day's output. In connection with his distribution work, the gas engineer has now to think in terms of peak hours and not maximum day, as it is very essential to have mains of sufficient capacity to deal with the peak hour. Another observed point is that, in the Dunfermline experience, there are thirteen hours, and in winter fourteen hours, per day during which the output exceeds, or is equal to, the hourly average make required for that day's output. Also that the daily output in summer is equal to 67 p.ct. of that in winter. These are extremely important facts; and they indicate how the diversity of the gas load is contributing more and more to the economy of gas manufacture and supply. In consequence of this, the difference between the minimum and the maximum daily consumption is being considerably narrowed. The President makes a point of this. The output rapidly increasing, and the minimum daily consumption equal to nearly 70 p.ct. of that of the maximum day, enable the carbonizing plant to be worked very economically. In 1920 an installation of twenty 5-ton Woodall-Duckham retorts was brought into service; and so well have they justified themselves, working with local coal, that an extension has been put in hand. The yields of therms and secondary products are stated in the address, but no analysis of the coal is given to round-off the information. The point, however, which we wish to emphasize is as to the carbonizing economies which are contributed to not only by the excellencies of the plant, but by the characteristics of the output. Carbonizing wages reflect the satisfactory trend of matters in regard to economy. In calculating this item, Mr. Campbell is deliberately comprehensive. The figure includes all men in the retort house, the conveyor man, the discharging of coal wagons, and the removal of coke—in fact, all charges from coal in wagon to coke in storage hoppers or to yard. In addition, he includes one-half of the wages of the works foreman, and the engine house attendant; also one-third of the boilermen's wages. Carbonizing wages (including all these items) were in 1920 7·95d. per 1000 c.ft. of gas sold; in 1922, 2·87d.; in 1923, 2·13d.; in 1924, 1·91d.; and in 1925, 1·95d. The year ending May, 1921, is omitted, as it did not cover a full year's working of the

new plant, and was the year of the coal strike. The gradual descent in carbonizing wages is noteworthy; the difference per 1000 c.ft. of the wages to-day as compared with the days of the old plant is remarkable—6d. per 1000 c.ft.! That 6d. contributes much to the capital charges. We are afraid, looking at the present condition of some gas-works plants, that sufficient consideration is not given to the savings that can be effected by adopting modern plant. Among other points which should not be overlooked is the economy to be realized in carbonization by the provision of ample gasholder capacity.

In connection with waste-heat boilers, the President related an experience which leads to a suggestion. Last summer ten retorts were in use necessitating the operation of three producers, which in ordinary circumstances must result in a considerable waste of heat; but with the recovery of the surplus heat in a boiler, a distinct saving is effected. During a portion of the summer, an extra producer was put under fire, and breeze and small coke were used in it. Admitting only a small quantity of secondary air to this bed, low heats are carried, a large volume of producer gas is passed forward in the waste-gas flue, and the bed is ready for use at a few days' notice. It was really a case of heating up a bed considerably in advance of its usual time; but it proved a very economical method of steam-raising. Mr. Campbell suggests from this experience that it might be worth consideration whether producers of large capacity might be designed for incorporation in vertical settings, in which unscreened coke containing a large percentage of breeze could be used, and the excess gas produced be led by a separate flue direct from the producer to the waste-gas flue for use in a waste-heat boiler. It should then be possible to dispense entirely with the ordinary works boiler—resulting in economy in steam production and lower capital costs, due to the elimination of boiler settings, chimney, &c. *Primâ facie* there is certainly good testimony here for further consideration; but it is, we think, one of those matters over which there cannot be generalization—investigation must be given to it from the point of view of the conditions of each works. Another suggestion is made in connection with the "T.I.C." tar dehydration system for the remarkably easy working and temperature control of which Mr. Campbell has a good word. The suggestion is that gas-works should make provision for the supply of mixtures of dehydrated tar and bitumen, for which a distinct demand has arisen. He has had a plant installed. The bitumen is melted by the waste-heat from the tar still; and the hot tar and melted bitumen are run into calibrated tanks for mixing.

The second part of the address treated of distribution problems and practices in the district—particularly in connection with high-pressure supply. This section of the deliverance will be found equally as interesting as the preceding one. In connection with it we must congratulate Dunfermline on its gas supply being under an administration and an Engineer whose ideals of public service stand high, and those ideals find materialization in their practices. With all the heavy capital expenditure which has been incurred during the past five or six years, the Engineer can point to a capital averaging not more than £530 per million c.ft. of gas sold. Last year gas was being sold at 2s. 6d. per 1000 c.ft., or 6·98d. per therm, with charges for power and industrial uses down to 4·18d. per therm. Though, due to the depression in secondary products, prices have had to be increased 4d. per 1000 c.ft., this means less than 1d. per therm on last year's charges. The consumers in many gas-supply areas may envy those of Dunfermline. Again, a modern standard type of hot-plate has been adopted for all cookers; and the old cookers are being systematically fitted with it. Not long since the department had a gas-engine expert to inspect the whole of the gas-engines in the area of supply. The Committee are now considering the question of general maintenance; and, in adapting policy to the times and all that is in prospect, they have before them the considerations of coal conservation, smoke prevention, and the large possibilities there are in the domestic and industrial heating field. We congratulate Dunfermline on its gas supply. We congratulate the President upon the enlightened spirit which animates his Committee; we congratulate the Committee upon having Mr. Campbell as their Engineer.

The Royal Commission for the Coal Industry.

AT last a finish has been given to the constitution of the Royal Commission who are to inquire into the economic conditions of the mining industry, and to make recommendations as to practical lines of improvement. There has been delay in bringing about the completion; and it has been mainly due to two causes. One was the holiday season; the other, that the Government desired to secure a small, but perfectly impartial Commission, without direct personal interest in the industry, and the members of which could afford the time necessary for what must be a searching and extensive investigation. The latter condition, we venture the opinion, has been the greater difficulty. But last Thursday, the names of the Commissioners were published. There are four, who are to be assisted by four expert assessors. The names of the Commissioners are: The Right Hon. Sir Herbert Louis Samuel, G.B.E. (Chairman), Sir William H. Beveridge, K.C.B., General the Hon. Sir Herbert Alexander Lawrence, K.C.B., and Mr. Kenneth Lee. The expert assessors are: The Right Hon. William Brace, Chief Labour Adviser to the Mines Department; Dr. Walcot Gibson, F.R.S., formerly an assistant to the Director of Geological Survey of Great Britain; Major H. M. Hudspeth, D.S.O., one of H.M. Divisional Inspectors of Mines, and Dr. C. H. Lander, Director of Fuel Research, Department of Scientific and Industrial Research. The Secretary of the Commission is Mr. C. S. Hurst, O.B.E., Assistant Under-Secretary of the Mines Department.

The question as to whether the Government have succeeded in finding a totally unprejudiced Commission can, we think, be at once dismissed, despite the grumblings and criticisms of certain men associated with the Miners' Federation that those appointed represent the capitalist element and that no labour man is a member. That charge was expected; it was bound to be made. It was similarly heard when the small Court of Inquiry was held recently into the causes of the dispute between the coal owners and the miners; and yet that Court reported strongly in favour of the miners. The fact of the matter is rampant misleaders like Mr. A. J. Cook cannot conceive that men of brains and position and decently clothed can be anything else than on the side of capital; and they cannot think that the trait of impartiality can be any stronger in them than it is in the extremist element in the labour world to-day. In the latter partiality is of such monumental proportions that it is impossible to trace a grain of impartiality. In this connection, by the way, among the conditions that vitally affect the coal industry are the objects and methods of the Miners' Federation and the actions of some of its components; and in considering such delicate matters, every member of the Commission must be altogether above suspicion in respect of bias. From this point of view we are inclined to think that people generally, other than Mr. Cook, his Communist associates, and the following of such men, will regard the constitution of the Commission as good.

As to competence, the composition of the Commission must be considered in association with the expert assessors. Notwithstanding large experience in political, economic, professional, and business lines, the work to which the Commissioners have now put their hands is so complex and involves so many technical and specialized problems that, without the assessors, we are afraid there might fairly have been some questioning of their capacity for this particular investigation which it is hoped will have important beneficial consequences for not only the mining industry, but the whole country. Information as to the professional occupations and public work upon which the Commissioners have previously been engaged has been published broadcast. It is of such a varied order that the knowledge and experience should be of great value in the conduct of the present inquiry; but at the same time we do feel that the tribunal might have been slightly enlarged with advantage by having two or three members upon it who are not professionally or financially interested, but who, through professional qualification and industrial knowledge, have a more intimate acquaintance with the affairs of the coal industry than any one of the existing Commissioners. Such men might have been

found in the engineering profession. The fact of their absence from the Commission places more responsibility upon the assessors, and yet there is not one of these who has personal experience of the financial complications of the coal industry.

We are not by any means casting reflection upon those who have been appointed to the positions of Commissioners or Assessors; but we do feel that the composition would have been better by the inclusion of other qualification. In our judgment, this will be a very general view among those who are concerned in, and have knowledge of the complexity of, the affairs of the coal industry, and of the veritable maze of matters which will have to come under examination.

Technical-Administrative Leaders of Industry.

An industry is all the better for having associated with it outspoken and fearless men, who do not hesitate to criticize when criticism is needed, and who do not neglect to give counsel when they have counsel of the first quality to offer. Sir Arthur Duckham is one of those men—outspoken and fearless; and, although we are not prepared to say he is infallible, we have found him as a rule an excellent counsellor. A contributor has called our attention to an article which has appeared in the "Mechanical World" on the subject of "Technical Leaders of Industry." It directs consideration to some recent utterances by Sir Arthur which contain regret of the circumstance that, whereas the leaders of the gas industry who made it what it is to-day were technical men—such as the late Sir George Livesey and Sir Corbet Woodall—those upon whom the burden now rests are commercial ("administrative" would be a better term) men only, and have not associated with them the type of technical men such as the two he had named, who did so much for the advancement of our great and beneficent industry. Our contemporary is careful to point out that Sir Arthur did not offer these criticisms in any spirit of belittlement, but only to call attention to the need for training technical administrators in industry generally.

We are not prepared to controvert Sir Arthur's submission that, as a general principle, it is a good thing for the individual leaders of any industry to possess a combination of technical and administrative talents. But we would remind Sir Arthur that the times change, and we and the necessities of the times with them. One of the greatest difficulties of the times is for industry to get men whose qualifications are high both in the technical and administrative lines; and when this cannot be done, then we have to secure the highest ability in each direction in separate men, and have organized leadership.

No one reveres the late Sir George Livesey and Sir Corbet Woodall more than we do. It was our lot and our pleasure to live in close intimacy with them. Both exercised an influence in moulding those fundamental principles which have been directive in the expression of views in these columns. They were giants in their day and in their spheres, and they did not stand alone. But, in some measure, they and a few contemporaries were outstanding in our industry because of the conditions under which the industry had grown in respect of its technical officials and its administrative boards and committees. We must not forget that fact; we must not forget, too, that we owe them more than we can estimate, inasmuch as they used their distinguished abilities, not for personal advantage, but for the good of the industry at large. Their technical and political work for the industry is imperishable. But before we said our last farewell to them, great changes had commenced within the industry; and those very changes would, had they continued with us, and had they been mentally and physically capable of carrying on their work, have—apart from the honour and affection which we all bore them—reduced their outstanding position owing to the gradual raising of the standard of engineering and commercial capacity among the men of the industry. As this process continues—and it will do so at a more rapid rate through the industry's educational, training, and research systems—so individual ability becomes less outstanding. That is one thing which must be borne in mind.

Now the great fact faces us and Sir Arthur's criticism that, since the passing of Sir George Livesey and Sir Corbet Woodall, the gas industry has, through its new circumstances, made greater progress than ever before, has travelled through more perilous times, and has, by the help of Sir George Beilby and parliamentary enactment, created for itself a new basis of operation which gives it more latitude and greater opportunities for expansion, and its organization is now more representative of the component interests of the industry than it ever was. The greatest advances that the industry has made during the past decade, the greatest problems with which it has had to deal, have been initially and essentially of political character, and the technical work—the engineering and the chemical work—has been in the form of an accompaniment. Yet we have made the most material progress during that period in our history. Facts speak loudly. The problems and the necessary creations of a legislative nature called for the highest administrative leadership—leadership perceptive, cautious, diplomatic, and strong. It was at hand, with a combination of counsel in which all the abilities required for the direction of an industry had part. We have done exceedingly well through the coalition of talent; perhaps more so than if we had had leadership of a less catholic order—leadership with the engineering, chemical, and administrative talents vested in the individual, who might perchance (as is sometimes the case) be, in consequence, dogmatic and autocratic. At the same time we do not dispute or disparage Sir Arthur's ideal of leaders being individually technically, commercially, and administratively qualified. It is a good ideal. Such leaders show strength in initiative and performance. But we have done well, and we are doing well, in the circumstances of our times; and above all we are directing our ways to objectives which will be of vast value to the future growth of the industry. And what is more, we have got out of old ruts, and are not sinking into new ones. There is an air of freedom about the industry to-day; and freedom is an aid to development. This has been brought about largely by (may we not call it?) our coalition leadership.

Low-Temperature Carbonization and Electricity Generation.

We know antipathy exists on the part of some electrical men to any sort of business alliance with gas undertakings in respect of the supply of fuel, or as tributaries of electricity, or in any other practicable way. This view finds more or less direct expression in the electrical papers, whenever opportunity occurs. But at the same time there is the feeling that the electricity industry stands in a very poor light in the matter of efficiency of coal utilization; and this naturally is not regarded as a brilliant engineering achievement. Consequently, there is again and again some advocacy, or implied advocacy, of the adoption of low-temperature carbonization; and articles appear on the subject. Every new process is brought to notice, in that it constitutes another possible outlet by which a higher efficiency and greater profit may be secured by the electricity industry. There are, however, some elementary facts which our friends should consider. They may say we are prejudiced. But our view is that in the combination of a low-temperature carbonization scheme and electricity generation there is great danger; and we do not believe that any system of carbonization applied to the electricity industry and worked in combination with it (independent of the gas industry) would prove of any utilitarian advantage.

To make a success of such a combination, there would have to be in the first place a market for the gas. The gas that is produced by the low-temperature method—say, per ton, merely 3000 to 4000 c.ft. of high calorific value—is too good to use for the purpose of steam-raising; and a market would have to be found for it. The only market would be the local gas undertaking; and the price which could be paid for it, delivered purified into gasholders, would have to be a shade below the net cost per therm of the gas produced by the gas undertaking's own processes—by carbonization, the production of water gas, or complete gasification. As to the other products—omitting coke for the moment—the tar would have to be sold in the crude state, unless subjected *in situ* to distilla-

tion. Whichever system was adopted, the crude tar or the distillates would be subjected to the vagaries of the markets. At the present time, the markets are in poor case, and this is a disadvantage to gas undertakings. The market value of sulphate of ammonia, too, is not what it was during the war and in the immediate post-war years; and it is not likely to ascend to such figures again. We can well imagine that electricity undertakings would not care to ally themselves with any process which would introduce such disturbing elements into their generating cost. As to the coke from low-temperature carbonization, this could either be gasified and the gas mixed with the richer gas produced from the carbonization process, or the solid fuel could be burned direct for the raising of steam. We come to the final conclusion. Let us suppose that the low-temperature process was adopted. The quantity of coke available for steam-raising purposes would be (say) 28 cwt. for every 2 tons of coal handled. The question for the electricity industry is whether that quantity of coke *plus* the small quantity of rich gas, and *plus* the variable receipts for the other products, would pay them for the handling and carbonization of every 2 tons of coal.

The electricity industry should look well into the capital, maintenance, and working costs of the system, and into the likely revenue, before coming to any definite conclusions on the subject. But the data should be derived from a reliable source, and from actual independent working. It is no use taking figures from a test plant worked on a small scale, and under the most elaborate supervision. To the gas industry, it might be an advantage if the electricity industry would saddle itself with the low-temperature process, excepting in one respect, which is that all additions to the production of secondary products helps further to depress already depressed markets. Despite the occasional propaganda in favour of the amalgamation of the low-temperature process with the electrical industry, we are not disposed to think that its technical men will be prepared to commit themselves to this course without thorough research. There is far more profit to be obtained by utilizing small coke or breeze in conjunction with the lower-grade coals under steam-boilers.

The Coal Subvention.

It appears likely that the first month's operation of the Government subvention to the coal industry will require no less than £1,600,000. This, however, cannot be taken as an indication of the average requirement during the nine months. The conditions in the industry fluctuate considerably from month to month. With colder weather and the winter approaching, combined with the unknown conditions that will rule at the end of May next, there should be an increased demand for coal; and if this is so, and costs can be lowered, the liabilities of the Treasury should be reduced. The reverse conditions, of course, would increase the liabilities.

British Empire Exhibition.

It is officially announced that there is no intention of continuing the exhibition next year. Less than a couple of months now remain for inspecting the wonders of the great display; and the public have awakened to the fact, with the result that full advantage is now being taken of the gradually waning opportunities of paying a visit. During August, 1,829,245 people found their way to the exhibition. The display of the gas industry is receiving its share of public interest.

Road Fund Surplus.

It seems that there is no genuine excuse for transferring the surplus of the Road Fund for a number of years to the purposes of the electricity supply industry. There is another and more legitimate use to which the money could be applied; and that is to provide motorists with elevated roadways or bridges over level crossings which are the most dangerous. Addressing the Economic and Engineering Sections of the British Association, Lord Montagu of Beaulieu expressed the opinion that it is a scandal that railway level crossings should still exist as first-class roads; and their removal should be one of the first uses to which the millions of pounds from over-taxed motorists should be put. Lieut.-Col. H. T. Tudsbery, of the Roads Department of the Ministry of Transport, stated that there is insufficient money to tackle everything that requires to be done; and everything possible is being done to get rid of level crossings and toll gates and bridges. If this is correct, then who is responsible for the unhappy idea that the available surplus millions in the Road Fund should be diverted from a legitimate to an illegitimate purpose?

The New Industrial Alliance.

Matters are not developing towards a new industrial alliance quite so smoothly as was hoped by those who initiated the idea, for the purpose of bringing a heavy weight of persuasion and action to bear upon the country when any resistance is shown to trade union demands. The delay in bringing about the consolidation is due to the fact that, the more the plan is looked into, the more the intelligent leaders of trade unions see the individuality and power of their own organizations being superseded by a central authority. Naturally, consolidation or alliance would be very ineffective without the central authority was invested with a large measure of control; and this could only be given by the sacrifice of individual autonomy. Occasions can also be conceived when the interests of the members of a component would have to be abandoned in order to serve the interests of the other components. The fact too that the prime movers in this business are men who talk of revolution and the preparation of labour food reserves for their great adventures, is not an encouragement to the more sober-minded among the leaders, or in the rank-and-file of the unions. Even the coal truce is regarded by them as merely providing a period for the development of revolutionary plottings and actions. What Mr. A. J. Cook, the Secretary of the Miners' Federation, thinks of the probable issues of the Royal Commission is shown by his frequent assertions that the end of May will see one of the largest labour upheavals ever experienced. A great deal will be heard at the Trade Union Congress this week of the amalgamation into one big force of all trade unions. A Committee who were appointed to consider the general question say it is of such vast order that further investigation must be made. It is obvious that they detect many obstacles; for they agree that the proposal is a long way from being realized. Those with the idea in mind may be certain of one thing; it is that if ever one vast amalgamation comes about, with such fanatics as we see in power in the labour world at the present time, there will be for the workers of the country perpetual labour disturbance and widespread misery.

Coal Movement in Times of Strikes.

An article which cannot be ignored by railway men who have any sense of honour appears in the "Great Western Railway Magazine." It is by the General Manager, Sir Felix J. C. Pole. He points out that a man has no right whatever to engage himself for employment and, while receiving payment from his employer, to refuse to carry out the work that he has contracted to do; also, that if employees were to obey a notification not to handle certain traffic, they would automatically break their service contracts and place themselves in a very serious position, while the Company would be obliged to obtain other labour to fulfil their obligations. Sir Felix urges the Company's staff to realize, before they have taken any such step, that interference in the labour disputes of other industries must involve them in trouble and loss, and mean that the railway industry will never be free from a condition of turmoil. These are wise words, which do not appeal to the Industrial Secretary of the National Union of Railwaymen (Mr. C. T. Cramp). He is reported to have said to a representative of the "Weekly Dispatch" that "if it is necessary to call out all the members of the N.U.R. to back up the miners, we shall call them out. Whatever may be the legal aspect of the case," said Mr. Cramp, "our conception of trade unionism is that one union should help another; and, if similar conditions should prevail again as on July 30, we would take the same action—of telling our men not to handle any coal during the dispute. Then, if the railway companies obtained 'other labour to handle the coal,' we should call a general strike of railwaymen."

ELECTRICITY SUPPLY MEMORANDA.

ATTENTION was recently called to the fact that the House of Lords have passed certain Bills which give to the municipalities concerned power to instal and equip electrical appliances—

Vending and Wiring.

a power which it has been difficult to obtain for some years, owing to the successful opposition of the electrical contractors. But the Parliamentary authorities are in these evolutionary and revolutionary days looking more benevolently upon municipal bodies having these powers as a logical supplement to their supply authorization; and it is the hope of the Lord Chairman that general powers will be accorded them. It appears to be thought that the time is particularly opportune to push forward the advantage the municipal authorities have secured through the obvious favour of the House of Lords in this matter; for the House in the past has been very jealous of the safeguarding of the interests of private enterprise. Efforts are therefore to be made by the Incorporated Municipal Electrical Association to organize the initiation of general legislation to realize powers for municipal undertakings to sell and instal electrical apparatus. However, from a reference to the matter at a recent meeting of the Dover Electricity Committee, it is clear that, within the local authorities themselves, there will be keen resistance to taking part in this proposal, because many members are tradesmen with deep sympathy for those who are engaged in local business, and therefore ready to act in their defence. It is held that there is already sufficient competition in electrical appliances to protect the public; but, on the other hand, the municipal electricity committees consider that the local electrical contractors are not in the position to offer the facilities and purchase terms which they themselves could do, granted the powers, for the benefit of the expansion of the business of the supply undertakings. It is also reported that the Parliamentary Committee of the Sheffield Corporation are proposing to help other Corporations to obtain powers to sell electric fittings and to wire private premises. The Sheffield Corporation from time to time have had contests with the local contractors over this matter. At present they have an arrangement with them which will run for another two or three years; but when that period has elapsed, the Parliamentary Committee will probably recommend the Council to apply for powers to sell fittings, and to undertake the wiring of consumers' houses. It is clear that before long another genuine tussle will take place between the municipalities and the contractors; and the likelihood is the former will now win. Parliamentary favour is set in their direction.

Light Depreciation.

In service, electric lamps suffer light depreciation which cannot be restored as is the case with incandescent gas-lamps. With the latter, by regulation and keeping of gas and air ways clean, the candle power of the light can be maintained at the original level. Not so with the electric lamp. Filaments undergo deteriorating change, and the inside of the lamp glass becomes blackened. In addition, there is the depreciation of light through the deposition of dust on bulbs and glassware. A paper by Mr. George Stevenson, of the Chloride Electrical Storage Company, Ltd., on "Constructive Salesmanship," as published in "Electrical Industries," contains a curve supplied by the Electric Lamp Manufacturers' Association Lighting Service Bureau, which shows the depreciation of light value due to settlement of dirt and dead insects on the reflecting and diffusing surface of a window lighting equipment. The curve covers eight weeks. It does not say which eight weeks of the year. It should do so, because according to the time of the year the dirtying effects on lighting glassware vary. Three units are dealt with—enclosed diffusing, semi-indirect bowl, and totally indirect. To each unit is ascribed an initial illuminating value of 8 foot-candles—at what plane is not stated. Taking 8 foot-candles as representing 100 p.ct. of illumination, then the curve shows that at the end of three weeks in the case of the enclosed diffusing unit, the foot-candles decreased from 8 to 7 (a drop of about 13 p.ct.); and a strange thing is that just a little below the 7 foot-candle, the curve continues in an almost straight line during the next five weeks. When the increased dirtiness produced by time begins to have further effect pon the foot-candles, is not stated. In the case of the semi-indirect bowl unit, the foot-candles fall from 8 to nearly 5 in three weeks (a drop of about 37 p.ct.), and then curiously the curve shows a perfectly straight line during the dirt accumulations of the next five weeks. The totally indirect unit is the most degraded one. In three weeks it falls from 8 to 5 foot-candles, and continues at about $4\frac{3}{4}$ during the remaining five weeks—about 40 p.ct. reduction. Thus the semi-indirect and the totally indirect systems are subject to greater depreciation than the enclosed diffusing unit. According to this singular curve, there comes a point where the additional deposit of dirt through time seems to have no effect. However, we need not believe the curve is wholly reliable in this respect—in fact, to be frank, we cannot quite credit the story it tells. Anyway, it shows that electric lamp fittings require cleansing the same as gas ones, but the interior of the bulbs cannot be cleaned; so that the loss of light through this cause cannot be restored.

Cooker Prices.

There has been consternation in the electricity supply camp, produced by the ugly rumour as to a possible increase of electric cooker prices. The "Electrical Times" is able to mitigate the sufferings of those who have been expecting that this increase was going to be a hindrance to their complete occupation of the gas-cooker field. There is, our contemporary asserts, to be no "general" increase in cooker prices. It does not say some of them are not to ascend—merely there is to be no "general" increase. That of itself is regarded as satisfactory. But before the annoying rumour came, there were those who anticipated that there would be a reduction of prices. The same fount of information declares that no reduction appears probable for some considerable time. It seems that from the manufacturers' point of view prices were prematurely reduced a couple of years ago. Only the improved market conditions prevented a rise; and "some little time must elapse before the continued improvement will allow of further reductions." It is added: "Anyway price stability is certain; and supply engineers who have been 'going slow' in anticipation of reduced prices have nothing to gain by a continuance of this policy."

Comparative Prices and Pressed Steel.

An interesting point is raised by our contemporary. We know that there is a substantial difference between the prices of gas and electric cookers of equal capacity. This disparity our electrical contemporary says is frequently attributed to the greater labour costs of electrical construction. This (so it is said) is actually only a relatively small factor. We do not believe the statement, because the labour involved in making the electrical parts is greater than the gas parts. The real difference, we see, is attributed to materials—mainly the cast parts. And this is the reason given: Much greater accuracy is demanded for electric cookers; and the price of a set of suitable cast parts may easily be greater than that of the finished gas cooker. Whether or not much greater accuracy is demanded for the cast members of electric cookers we are not prepared to say; but we are ready to challenge any superiority in the casting work for electric cookers as compared with that for gas cookers. The makers of the latter are pastmasters in foundry work; and the castings produced by the best gas-stove firms cannot be excelled in respect of material, exactitude in measurement, and finish. But if much greater accuracy is demanded for electric cookers, why is it? Is it to prevent the loss of those dearly purchased heat units? Our contemporary suggests that probably mass production is the only way by which any considerable reduction in the price of electric cookers can be brought about. It is urged that serious contemplation should be given to this. Also the suggestion is made that the advantages of all-pressed steel sheet construction should be weighed against those of the present method of manufacture—partly cast iron and partly sheet steel. "If the large output to justify laying down the expensive plant necessary to the production of all-pressed steel cookers can be secured (and it certainly appears probable that it could in the next year or two), then there should be no great difficulty in producing a stout serviceable piece of apparatus at a much reduced price." The "if" with which the quotation starts is in this regard all-powerful. But all-sheet steel cookers have not been able to make a forcible appeal in the past, and are not likely to do so in the future. They have been tried, and have been found wanting.

Exaggeration Again.

If memory is not playing us false, on various occasions we have remonstrated with our contemporary the "Electrical Review" over allowing statements regarding gas to appear in its columns which are not true. These, we will admit, are usually supplied by contributors; but it is our contemporary that gives them circulation. Only last week we called attention to an editorial article on exaggeration which had appeared in its columns. We would suggest that our respected contemporary should use its right to eliminate exaggeration and misstatement from the writings of its contributors and correspondents, when it recognizes them to be such. If they continue to appear, after the recent editorial, we shall be forced to the conclusion that those responsible for the editing of the "Review" do not appreciate that they are misstatements or exaggerations, or that they endorse them. We will give an example. A letter by E. O. Walker, of Manchester, appeared in the issue of our contemporary for Aug. 28. The writer, referring to a letter by another correspondent, said: "If he will compare a joint of meat cooked electrically and a similar joint of meat cooked in a poisonous gas, he will find that he gets his electricity for nothing." Now we would like the "Review" to put a definite name to "poisonous gas," in order to let us know precisely what is meant. The products of combustion from free-burning flames in a gas-oven are water vapour and carbon

dioxide, which are not "poisonous." Naturally, if a human being enters an atmosphere of carbon dioxide, or of any other gas which is not poisonous, he would be suffocated. But water vapour and carbon dioxide do not mean that a joint is cooked in a "poisonous gas." The use of the term in this connection is a gross exaggeration and a slander; and we are surprised that the "Review" permitted its publication. However, we shall be pleased to hear what it has to say on the subject. Perhaps while explaining what is meant by "poisonous gas" in an oven, it will tell us something as to the quantity present, remembering the amount of air passing in and out of the oven.

The "Electrician" Errs.

We are delighted to find that a recent editorial article in the "JOURNAL" has occasioned "some little amount both of surprise and amusement" to our contemporary the "Electrician." It says the "JOURNAL" is now advocating that the policy of concentration which the Electricity Commissioners have in view should be applied with certain modifications to the gas industry. Our contemporary suffers from gross carelessness. If our article is read again, it will be seen that there are some magnificent examples of manufacturing concentration in the gas industry which were brought about long before the Electricity Commissioners came into being. The article in question was particularly directed to the advocacy of an extension of bulk supply by the larger undertakings to small contiguous concerns. Having, we hope, put our contemporary right on this point, we should like it to give an explanation as to what it means by: "If the transmission of power by electrical means is often expensive, as the 'GAS JOURNAL' points out, it is still more expensive and limited in scope when gas is used." In giving us the data and its authority for this statement, we suggest it should not overlook the high-pressure transmission of gas which is now generally being practised in the supply of outlying areas.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

Sept. 9, 10, 11.—IRON AND STEEL INSTITUTE.—Autumn meeting in the University, Edmund Street, Birmingham.

Sept. 14-16.—INSTITUTION OF PUBLIC LIGHTING ENGINEERS.—Second annual meeting and conference at Leeds.

Sept. 15-17.—IRISH ASSOCIATION OF GAS MANAGERS.—Annual meeting in Belfast

Sept. 16-17.—REFRACTORY MATERIALS SECTION OF THE CERAMIC SOCIETY.—Meeting in the rooms of the Chemical Society, Burlington House, London, W.

Sept. 23.—EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.—Autumn meeting at Stamford.

Sept. 24.—WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.—General meeting at Cardiff.

Oct. 15.—MURDOCH LODGE.—Meeting.

Oct. 19-21.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual conference and general meeting in Plymouth.

Oct. 30.—LONDON & SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Meeting at the Westminster Technical Institute.

INSTITUTION OF GAS ENGINEERS.

Oct. 12.—2.30 p.m., Refractories Research Joint Committee.

Oct. 13.—4.0 p.m., Consultative Committee of the Education Scheme, followed by meeting of the Advisory Committee.

Oct. 22 (provisional).—2.30 p.m., Emergency Committee. 3.15 p.m., Finance Committee. 3.45 p.m., Council Meeting.

Nov. 10.—4 p.m., Advisory Committee on Education.

Nov. 11.—11.30 a.m., Emergency Committee. 12.15 p.m., Benevolent Fund Committee of Management. 12.45 p.m., Finance Committee.

Nov. 25.—11 a.m., Institution's session at the Public Works, Roads, and Transport Congress.

Dec. 2.—Official visit to the Shipping Engineering and Machinery Exhibition at Olympia.

Dec. 8.—4 p.m., Advisory Committee on Education.

Dec. 9.—11.30 a.m., Emergency Committee. 12.30 p.m., Finance Committee.

MOVEMENT OF FLAME IN CLOSED VESSELS.

An article on this subject by O. C. de C. Ellis and R. V. Wheeler which appeared in the August issue of "Fuel in Science and Practice" has been reprinted in pamphlet form. It deals with the manner in which flame spreads in an explosive mixture contained in a closed vessel when ignition is effected at a given point—which knowledge helps to an understanding of the manner of development of pressure within such a closed vessel (in a gas engine cylinder, for example), and should aid in the elucidation of some of the problems connected with internal combustion engines.

In the article mentioned, photographs are placed on record illustrating the spread of flame in explosive mixtures contained in spherical and cylindrical vessels, which yield information of the behaviour of flame in mixtures initially in a quiescent state and at atmospheric temperature and pressure, and check the correctness of certain assumptions that have been made by previous workers on this subject. For example, when considering the inflammation of mixtures of methane and air in closed spherical vessels, Wheeler ("Trans." Chem. Soc., 1918, 113, 840) assumed that, if the ignition of the mixtures is exactly at the centre of a sphere, the propagation of flame follows regular concentric spherical surfaces in such a manner that the boundary is reached simultaneously at all points. For, except with very slowly moving flames, or possibly in very large vessels, convection currents would not appreciably affect the speed in any particular direction. It was shown experimentally that with any mixture of methane and air containing more than 7·5 and less than 12·5 p.ct. of methane, the time taken for flame to travel from the centre of a closed vessel to the top and to the bottom was the same.* Further, it could be deduced from the times taken for the development of the maximum pressures when a series of mixtures of methane and air was inflamed in spheres of 9·75 and 15·6 cm. radius, that (ignoring the initial impetus given by the impulsive discharge used to cause ignition) the speed at which flame travelled from the centre to the walls of the spheres was uniform. The general correctness of these assumptions regarding the manner in which flame spreads from the centre of a closed spherical vessel is proved by a series of photographs. Another series depicts successive stages in the propagation of flame in the same mixture.

As regards the propagation of flame in cylinders, Mallard and Le Chatelier (Ann. Mines, 1883 (viii.), 4, 379), in connection with their work on the pressures produced by gaseous explosions, made assumptions (from time-pressure curves) which are now shown to be correct. They used a cylinder the length and diameter of which were equal (17 cm.), and ignited the mixture at the centre. Their description of the manner in which the flame spread from the spark-gap can be freely translated as follows:

"Owing to the unfortunately faulty shape of our explosion vessel, the propagation of flame assumed two phases. The inflammation, produced at the centre of the cylinder by the spark, is at first propagated away from the point of ignition as a kind of spherical wave which continuously increases in size until it touches the walls of the cylinder. The height of the cylinder being equal to its diameter, the wave (if it remains spherical) touches the sides and the top and bottom plates simultaneously. The second phase in the propagation then begins, and continues until the flame reaches the curve of intersection of the end plates with the cylindrical walls.

"During the first phase, the propagation takes place without appreciable cooling, since the wave of flame has not yet touched the walls, and there is, therefore, no loss of heat other than that arising from radiation and the small amount due to the abstraction, from the unburnt mixture in contact with the walls of the vessel, of the heat of compression caused by the expansion of the burnt mixture near the centre. Both these causes of loss can be regarded as negligible.

"During the second phase, on the contrary, cooling by the walls takes place and increases as the propagation proceeds, since the area of the surface of the cylinder in contact with the flame increases."

The correctness of Mallard and Le Chatelier's deductions is demonstrated in further photographs in the article.

*With mixtures containing less than 7·5 or more than 12·5 p.ct. of methane, in which the rate of propagation of flame is slow, flame reached the bottom of the vessel later than it reached the top by an interval that varied with the methane content of the mixture.

"Scientific Paradoxes and Problems."—On Sept. 15 the Old Westminster Press will publish, at 5s. net, a book by A. S. E. Ackermann, B.Sc., entitled "Scientific Paradoxes and Problems, and their Solutions," and written as a result of numerous problems which were received by the author from many correspondents during his series of "talks" from the London Station of the "B.B.C." early this year. The volume, which has an introduction by Prof. C. V. Boys, explains concisely and clearly nearly a hundred interesting paradoxes and problems, and contains 132 pages. It may be remembered that Mr. Ackermann is the author of "Popular Fallacies."

Ceramic Society (Refractory Materials Section).—There is to be a meeting of the Refractory Materials Section of the Ceramic Society, in the rooms of the Chemical Society, Burlington House, London, W., on Wednesday and Thursday, Sept. 16 and 17, under the Presidency of Mr. Frank West, who will deliver his address on the latter day. At that session, also, Mr. W. J. Rees, B.Sc., will present a note on "Some Cases of Spalling of Silica Bricks in Gas Retorts." The papers for the Wednesday include one by Mr. J. F. L. Wood, Mr. H. S. Houldsworth, B.Sc., and Prof. J. W. Cobb, on "The Influence of Foreign Matter on the Thermal Expansion and Transformations of Silica."

LIFE OF WASH-OILS.

In "Brennstoff-Chemie" for June 15 and July 1, H. Kiemstedt dealt at some length with the question of wash-oils commonly used for benzole extraction. The life of those which are generally made from coke-oven tar is, he says, by no means consistent or satisfactory. He reviews the various treatises which have appeared on the subject in recent literature, and supplements the findings of others with a summary of observations of his own.

It is in some respects quite justifiable to contrast the advantages of other oils, such for instance as the paraffin oils which are sometimes used, with the disadvantages of the more usual tar oil, with special reference to the thickening which it undergoes in use—that is to say, the chemical change in its constituents. But it is not correct to maintain that this advantage exists in every case, as there are instances in practice where the life of tar oils is in every way satisfactory. Apart from the fact, however, that comparisons between tar oils and paraffin oils when reviewed from all aspects—that is to say, from the technical as well as the economic point of view—do not always work out to the disadvantage of the former, it is obviously to the interest of gas-works and coke ovens to find out something of the reasons for such striking variations as occur in the behaviour of tar wash-oils, and so to try to extend their useful life.

The causes of the thickening must not be sought in any single direction, and the lines of investigation should follow the question as to how one oil behaves in different methods of working, and how various oils behave with the same method of working. No satisfactory answer can be expected from laboratory research alone, since all the pertinent factors are probably not known, and so cannot be brought into account. But observations from practice and the laboratory together should be capable of suggesting means whereby the life of tar oils may be improved. The author summarizes his conclusions by saying that the thickening process in a wash-oil depends upon its original nature, but it is also influenced, as regards the rapidity of the process, by the method of working and the composition of the gas treated.

From available literature, and from his own work, he can make certain recommendations. In the first place, as regards the composition, attention should be paid to the quantity of phenols and unsaturated combinations present, as these, to a greater extent than other constituents, are influenced by the oxygen, the sulphur, and probably also the splitting action of superheated steam, and the polymerizing effect of inorganic impurities and of pressure. In addition, the phenols retain water, and thus enable the sulphuretted hydrogen to attack the material of the plant, and in this way to introduce iron into the oil. Further, the separation of the water requires unnecessarily high temperatures. For these reasons the phenols should be eliminated as far as possible, and also the basic portions, as these exercise an unfavourable catalytic influence. Iron or any other mechanical impurities should especially be noted, as such matter in itself gives rise to polymerization, and also considerably assists the other reactions already mentioned. Oxygen in the gas directly attacks the oil, and it also enables the sulphuretted hydrogen to begin its harmful action. If possible, the dry purification should precede the benzole scrubbers, as, in this way, the greater part of the oxygen is eliminated, as well as the sulphuretted hydrogen. Effective condensation of water vapour is important, as also are the best possible preheating, and moderation in the temperature of the steam or gas used in the heating process. It is advisable to use as little steam as possible, and only moderately superheated, in the distillation process, and to avoid, as far as possible, pressure, in so far as these factors cannot be entirely eliminated by the use of vacuum.

Coke-Oven Gas in America.

In an address delivered to the students of the Gas Engineering Course at the John Hopkins University, Mr. S. J. Ramsburg said that in no place in the United States is there a better exemplification of the benefits derived by a community from the use of bye-product coke ovens than in the City of Baltimore. Last year the total quantity of gas sold amounted to 10,681,599,000 c.ft., and the average price was 79.35c. per 1000 c.ft. No less than 44 p.ct. of this gas came from the modern coke-oven plant at Sparrows Point, of the Bethlehem Steel Company. It is safe to say that the average selling price in all of the other great cities of the East was not less than 95c. per 1000 c.ft. for an equivalent thermal content. On this basis, the saving brought to the people of Baltimore by the use of this gas was not less than $1,671,576 in one year. With the probably increasing cost of gas oil in the future, this saving will become more marked. Approximately 601,000,000,000 c.ft. of gas was made in 1923 in the bye-product ovens of the United States, and of this quantity 65,000,000,000 c.ft. was distributed through town gas mains. This represents over one-half of the total coal gas made in all types of apparatus; the balance being produced in various kinds of retorts.

"SUPPORT HOME INDUSTRY."

[CONTRIBUTED.]

In his evidence at the Board of Trade Inquiry into British Trade and Industry, Mr. D. Milne Watson, giving evidence in the capacity of President of the National Gas Council, said: "One of the features that is noticeable in this country is that as a rule we are not animated by a sufficient sense of commercial patriotism when making our purchases Generally speaking, consumers do not consider the desirability of giving preference to British goods. . . . If consumers could be induced, even at a slight sacrifice, to purchase more British goods, the home trade would be stimulated. . . . I strongly suggest that steps should be taken to awaken the national conscience on this point." The Federation of British Industries have also put forward a plea for educative work on the matter referred to by Mr. Milne Watson.

With the sentiments expressed by Mr. Milne Watson there must be complete agreement. The disposition to save a "ha'penny" by taking foreign instead of home-produced goods is too common, and even the gas industry is not free from it. It is refreshing to have this evidence that the policy of the National Gas Council is to-day favourable to home-produced mantles. If memory does not fail one, there were, when the matter was originally the subject of inquiry by the Safeguarding of Industries Committee, members of the Council who opposed the imposition of a duty which was specially designed to protect home producers. There were, however, other members who did not approve of this attitude, and some have consistently, right through the post-war years, confined their purchases to British mantles.

There is, however, another side to this question. If British consumers are to be successfully appealed to, British producers will have to display greater co-operation than is sometimes the case. It is rather too much to ask for patriotism that it shall bolster-up lack of initiative and poor service. Here is a little recent experience which will serve as an illustration of the sort of thing consumers will expect to be saved from.

A small gas company asked for a quotation for a few tons of 4-in. S. & S. cast-iron pipes, 12 ft. long, in order to give a supply of gas to new property which would be ready for consuming in four to six weeks. The following were the tenders received, with the time required for delivery:

—	Per Ton.	Delivery—Weeks.
	£ s. d.	
British—		
No. 1	10 17 6	6 to 8
,, 2	11 0 0	10
,, 3	11 15 0	12 to 16
,, 4	11 5 6	14
Continental—		
No. 5	10 0 0	4

It will be seen that the shortest period in which a British firm could make delivery was 6 to 8 weeks, as compared with 4 weeks for Continental pipes. Three other firms required from 10 to 16 weeks. These are all old-established firms—leading pipe makers, who advertise for business in the Technical Press. Patriotism might rise to the point of paying from 9 to 17½ p.ct. more for pipes, but should it encourage the dilatoriness in delivery? Possible lines of defence may be here anticipated. It may be urged that 12-ft. lengths of 4-in. pipes are unusual, and that 9-ft. lengths might be delivered more quickly. But the 12-ft. length is cheaper to use, entailing fewer joints, and less lead and labour in making them. If suppliers of foreign pipes can give quick delivery, why cannot British makers rise to the occasion? Another possible defence may be that there has been a "run" on this size of pipe. But surely, with 1,300,000 unemployed in the country, British pipe makers can hardly claim to be pulling their weight in the solution of the unemployment problem if they cannot put to stock sufficient pipes of smaller sizes to ensure reasonably prompt delivery.

The moral of this experience concerning cast-iron pipes, which is typical rather than exceptional, is that, not merely is a campaign needed among consumers to support more heartily British goods, but a supplementary campaign urging manufacturers to give as good service as is afforded by buying foreign products. Anyway, the pipe makers must not complain if, while this state of things in regard to delivery prevails, orders go abroad which might usefully be kept in the country.

Mr. William Garton, formerly City Gas Accountant at Nottingham, left estate of the gross value of £6471, with net personalty £6415.

Mr. John Lynch, for several years Secretary of the Navan (Co. Meath) Gas Company, has passed away in his 61st year. He was an able and conscientious official, greatly esteemed by the Company and the public.

TECHNICAL LEADERS OF INDUSTRY.

[COMMUNICATED.]

A recent issue of the "Mechanical World" contains an ably-written article under the above title. It opens with the statement that British industry has often been blamed for the fact that its commercial men and leaders are not also technical men, and *inter alia* refers to the public declaration recently made by Sir Arthur Duckham that what is needed at the present industrial momentous juncture is scientific leadership in industry. Sir Arthur regretted the circumstance that, whereas the leaders of the gas industry who made it what it is to-day—such men as the late Sir George Livesey and Sir Corbet Woodall—were technical men, those upon whom the burden now rests are commercial men only, and, moreover, have not associated with them the type of technical man such as the two he had named, who did so much for the advancement of that great and beneficent industry.

The article referred to states: "In short, he (Sir Arthur Duckham) made it clear that the present leaders of the gas industry do not represent that desirable type—the combination of the technical and the commercial man." Says the "Mechanical World," "we will leave the gas industry to tackle Sir Arthur Duckham on the specific case to which he has drawn attention, because it is for the leaders of that industry to justify themselves, if they think it necessary. At the same time, we know that Sir Arthur Duckham does not offer these criticisms in any spirit of belittlement, but only in order to call attention to the need for training technical administrators in industry generally."

What have the leaders of the gas industry to say in reply to these strictures? Its flourishing condition at the present time surely affords evidence that its leaders possess initiative; that they value the importance of research work, and are alive to the need for improvement and development of manufacturing methods; that they realize the vitality of the industry's competitors, and the pressing need for the exercise of acumen in all departments of the activities of the industry.

Possibly in Sir Arthur Duckham himself (though his modesty would not permit him to acknowledge it) there is one of the most striking examples of the type of technical-commercial man such as he says the gas industry lacks to-day. His abilities were quickly recognized and turned to excellent account during the period of the war by those best qualified to weigh them up; and he was not found wanting. Recently the powers that be, in connection with the Government Air Services, have turned again to him with a view to making further use of his brilliant attainments as an engineer and as a commercial man.

The writer holds the conviction that a good technical training forms an indispensable foundation for a commercial superstructure; the latter should be a natural continuation and completion of the former. The result—an edifice of utility full of splendid possibilities—would be a leader. The converse—a commercial foundation with a technical superstructure—could not possibly, in the writer's opinion, produce this type of man.

In what other way than by actually "going through the shops" can a man acquire a real knowledge of workmen—those with whom he will later on have so much to do? Their psychology, temperament, difficulties, aspirations—all are vitally important, and must be understood by the industrial leader in embryo. This was a favourite and constant contention of the late Mr. H. E. Jones, who considered a workshop training a *sine qua non*. Of all the essentials to success in an industrial leader surely the knowledge of how to get on with his men comes easily first. These past few weeks, pregnant with an overwhelming national catastrophe, happily averted, have shown how invaluable in industrial leadership is the possession of ability to understand in the fullest possible way the minds of the men who are presenting their case for consideration.

The question of how far the gas industry itself lacks men of the type indicated by Sir Arthur Duckham, or needs to train them, is, of course, open to discussion. Differences of opinion there are bound to be.

In recent years there has been a growing tendency to place engineers on the directorates of gas undertakings—surely a recognition of their ability as technical men to assist in the successful commercial development of their concerns. Notable examples will readily occur to the mind. Mr. Thomas Goulden became a member of the Court of Directors of the Gas Light and Coke Company. The South Metropolitan Gas Company have as their President Dr. Charles Carpenter, who at last year's meeting of the Institution of Gas Engineers strongly advocated the idea of engineer directors, though in the recent Parliamentary proceedings in connection with the consideration of his Company's Bill he may appear to have given the chemist preference in that respect. Then there are Mr. Charles Hunt, of the South Suburban Gas Company; Mr. Stanley H. Jones, of the Commercial Gas Company; Mr. A. E. Broadberry, of the Tottenham District Light, Heat and Power Company; Mr. W. E. Price, of Hampton Court; and Mr. W. H. Bennett, of Redhill. Instances could be multiplied.

On the other hand, there are, of course, many examples of men who have had no technical training, but who are to-day occupying with marked success high positions as administrators. Mr. D. Milne Watson, Governor of the Gas Light and Coke Company; Mr. Henry Wade Deacon, of Liverpool; Col. H. K. Stephenson, of Sheffield; Mr. R. W. Edwards, of Aldershot; Mr. W. Woolley, of Derby; Mr. J. E. Cowen, of Newcastle-on-Tyne; Mr. J. H. Ellis, of Plymouth; and others.

But in such cases we believe that the leading technical men who are associated with them play a very active part in the commercial achievements which their respective undertakings have scored. Is it not a fact that these men are in the closest contact with the administrators, even if they are not administrators themselves? A sagacious board of directors or a committee will take good care to see that the engineers whom they appoint are fully capable of advising them in an administrative capacity. This is evident from the published records of how the good results of working have been obtained. Successful leaders of industry possess the valuable faculty of discerning the men best suited to aid them in their work; and they make their selection accordingly.

In considering this interesting topic from the gas industry's point of view, one cannot help regarding the existing relationship of the two technical bodies representing the industry—the Institution of Gas Engineers and the Society of British Gas Industries—for the question of training the technical-commercial man is involved in this. Would it not be an advantage for the members of each organization to meet as one body, thereby learning more readily than is now possible of each others' successes, failures, and difficulties? After all, everybody engaged in the industry is working for its prosperity. The plant engineer (*i.e.*, the commercial man) and the works engineer (also a commercial man so far as his own undertaking is concerned), by jointly discussing matters which are of common and vital interest to the success of the industry as a whole, would be advancing its interests to a material degree. On such subjects as the life of gas meters, refractory materials, gas valve flanges, gasholder plates, and in important work on committees of the British Engineering Standards Association, representatives of each Society have been found advantageously working hand in hand, and are still doing so.

The writer believes that a more extended, closer, and general association would be to the benefit of all. From it would emerge men having a clear vision of the great potentialities of the gas industry, endowed with all the attributes of leadership, and distinctly seeing before them the road which must be traversed for the realization of its highest aspirations.

Synthetic Ammonia Catalysts.

In order to study the various problems of catalysis which are peculiar to the synthetic ammonia process, the firm of Lazote (Incorporated) have installed a catalyst laboratory at the Wilmington (Del.) experimental station of Messrs. E. I. du Pont de Nemours & Co.; and this plant, which embodies many interesting features, is described in the August issue of "Industrial and Engineering Chemistry." One of the main features is the high-pressure catalyst-testing installation, the purpose of which is to permit of testing a wide variety of catalysts for the reaction between nitrogen and hydrogen under a diversity of conditions. It is occupied principally in determining the activity and longevity of these materials under variations of conditions which parallel as closely as possible those met in commercial operation. The chief operating variables which the installation is equipped to study are temperature, pressure, gas flow, and purity of the gas mixture. It is possible to use reaction temperatures up to 800° C., and the pressure may be varied from atmospheric pressure to 1000 atmospheres or above. The present installation permits gas flows as high as 2,000,000 space velocity (space velocity being defined as unit volumes of gas, measured at 1 atmosphere pressure and 0° C., passing through unit volume of catalyst per hour). Special arrangements are made for the introduction into the synthesis system of the gaseous impurities most often met in practice—such as carbon monoxide and methane. The installation is equipped with ten catalyst furnaces, which may be operated either in parallel or in series, thus permitting the testing of the same or ten different catalysts at once under a variety of conditions of pressure, temperature, and gas flow. The plant is particularly adapted to carry out catalyst testing for ammonia synthesis; but it may easily be converted to the testing of catalysts for other gas reactions.

Gas for Heating Small Greenhouses.—Many amateurs who have their small greenhouses placed in favourable positions are still unable to provide flower blooms during the cold months, or to raise certain seedlings in the very early days of the year, when it is necessary that they should be raised, if the best results are to be achieved. They lack just that small amount of artificial heat in the greenhouse which is essential on cold days—heat which, however, can be easily provided with a minimum of labour and at a cost so low that it is a matter of some surprise that more have not availed themselves of this great boon. The current issue (No. 138) of "A Thousand-and-One Uses for Gas" contains practical notes on the heating of small greenhouses, and a wealth of illustrations.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

ANNUAL GENERAL MEETING.

THE Annual General Meeting of the Association was held in the Council Room of the City Chambers, Dunfermline, on Thursday last. Mr. JAMES CAMPBELL, Gas Engineer, of Dunfermline (the President), occupied the chair; and the attendance of members was probably one of the best in the annals of the Association. Accompanying the President on the platform at the outset of the proceedings were Provost Fraser, Dunfermline; Mr. Andrew Shearer, Town Clerk, Dunfermline; Mr. J. M. Smith, Convener of the Gas Committee of Dunfermline Town Council; Messrs. John Wilson, Motherwell, and James Bell, Dumbarton, Vice-Presidents; Mr. J. W. M'Lusky, Glasgow, Immediate Past President; and Messrs. S. Milne, Aberdeen, H. H. Gracie, Edinburgh, and J. W. Napier, Alloa.

[*Photo. by James Norval, Dunfermline.*

MEETING OF THE NORTH BRITISH ASSOCIATION AT DUNFERMLINE.

A CIVIC WELCOME.

Provost FRASER, opening the proceedings, said he had great pleasure, as Chief Magistrate of the ancient and royal burgh of Dunfermline, in bidding the members of the Association welcome. The fact that at one time he had been Convener of the gas undertaking in Dunfermline added to this pleasure. During his tenure of office in that capacity, he recognized that there were great possibilities in the industry; and he was glad to think that, under the capable management of Mr. Campbell, these possibilities had in large measure been taken advantage of. This had been accomplished by sound management, and with the cordial goodwill and approval of the members of the Council. He relinquished the convenership of the gas undertaking with regret, but with a feeling of satisfaction that the office was about to be filled by an able and enthusiastic co-worker, Councillor J. M. Smith.

Councillor J. M. SMITH (Convener of the Gas Committee) reminded those members present that he had the privilege of taking part in the spring meeting of the Association in Edinburgh, and on that occasion he conveyed a cordial invitation to the members to hold their annual meeting in Dunfermline. The City Council were glad to see so many visitors in their midst. They accepted this numerous representation of the membership of the Association not only as a compliment to Dunfermline, but as a genuine token of goodwill and respect for Mr. Campbell. It was the hope of the City Council that the visit might be enjoyable. For managers of municipal gas undertakings, he supposed the year that had gone had not been a particularly happy one. At the spring meeting, he had rather boasted of the fact that in Dunfermline they were in a position to sell gas at 2s. 6d. per 1000 c.ft. Since then, notwithstanding the fact that they had in the President one of the shrewdest engineers in Scotland, it had been found necessary to increase the price to 2s. 10d. Mr. Campbell, as they all knew, was a great enthusiast in everything that pertained to the gas industry. Taking a long and a broad view of the outlook, it seemed to him that real progress in the gas industry depended in large measure on the manner in which gas engineers did their work. Individual enthusiasm was much required; and it was the duty of every manager to put the very best he could into his work. If all did this, they need fear no opposition.

The PRESIDENT, on behalf of the members, conveyed to the Corporation a sense of the appreciation which all felt of the cordiality and heartiness of the welcome extended to them. To himself it had been a great satisfaction to note with what enthusiasm the Convener of the Gas Committee and the members of the Council had entered into the arrangements for the meeting.

THE MINUTES.

The SECRETARY (Mr. David Fulton, of Helensburgh) read the minutes of the last annual general meeting, and they were confirmed.

COUNCIL'S ANNUAL REPORT.

The PRESIDENT, referring to the report [*ante*, p. 545], observed that the Council had agreed to recommend that Mr. Alexander Yuill, ex-Engineer and Manager of the Dundee Corporation Gas Department, should be elected an honorary member. It was well known that Mr. Yuill had all along taken an active part in the work of the Association, and it was only fitting that they should bestow upon him the highest distinction within their power. It would be further noticed that, in connection with the scheme for education and certification of gas engineers, a Scottish Advisory Committee had been formed. He was glad to say that, on the whole, the work of the Committee promised exceptionally well. He formally moved the adoption of the report and accounts.

Mr. J. W. M'LUSKY (Glasgow) said there was a reference by Mr. Archibald Kellock, the Hon. Secretary of the Commercial Section for the Western District, to the disposal of residuals, particularly coke. He did not wish to raise this question in any grumbling sense, nor yet in a critical spirit; but he felt there ought to be more said on this topic than the simple statement which appeared in Mr. Kellock's report. Mr. Johnstone, in his report for the North-Eastern District, was more communicative. Mr. Kellock knew him (the speaker) well enough to appreciate the fact that he was not putting the one report against the other. He had been prompted to raise this question because of his desire to remind members that, whether they were commercial men or not, it could not be said that they were selling coke if they simply dumped it into the territory of their neighbours. It was foolish to strike a note of self-congratulation over a yard being empty, if the coke had been put into the area of a neighbouring manager. The only people who had benefited by coke transactions during the past three or four months had been the railways. Complaint had been made that there had been a serious fall in the price of coke—

that, in fact, it had decreased from 35s. to 15s. Why should that be? If the Corporations of Glasgow and Edinburgh locked-up their supplies of coke ordinarily intended for the export trade to Scandanavia, why did other managers cut the price throughout the country? He detested a note of self-congratulation being sounded over empty yards, when all that had happened was that the coke had been transferred to the areas of near neighbours. He desired to see some sort of adherence to the policy set-up by the Association some years ago; but from the experience of the past year, he was prepared to say that 90 p.ct. of the gas undertakings throughout the country had benefited from the fact that Glasgow and Edinburgh had locked-up their supplies of coke. He pleaded for greater loyalty among those in control of gas undertakings. It was neither selling coke nor was it good salesmanship to dispose of supplies at 5s. a ton less than anybody else.

The point raised by Mr. M'Lusky was not pursued further, and the motion for the adoption of the report was unanimously agreed to.

New Members.

The Secretary said that, since the report was printed, he had received applications for membership from the undernoted:

Extraordinary Members.—Messrs. John W. Mitchley, M.I.Mech.E. (Messrs. Blair, Campbell, & M'Lean, Glasgow), Thomas Shearer (Messrs. Shearer & Munro, Glasgow), and James Thom (Messrs. Stewarts & Lloyds, Ltd., Glasgow).

Associates.—Messrs. Marshall A. Waddell, Assistant, South Queensferry, and George Keillor, Jun., Assistant Engineer and Manager, Dunfermline.

They were unanimously admitted to membership.

The President then delivered his address.

PRESIDENTIAL ADDRESS OF MR. JAMES CAMPBELL.

I appreciate very highly the honour conferred upon me by the members, when, in September of last year, they elected me to the responsible position of President of the North British Association of Gas Engineers—an honour of which I am proud, and for which I tender my heartiest thanks. I must confess to having accepted office feeling the responsibility attaching to such a position, and with a jealous regard for its dignity and traditions; but with the cordial assistance of the Members of Council, whose help I would gratefully acknowledge, my task has been made easy, and I am content to leave the verdict as to the past year's work in the hands of the members.

THE PRESIDENT, MR. JAMES CAMPBELL,

Engineer and Manager, Dunfermline Corporation Gas Department.

To hold the office of President of our Association is a splendid opportunity to render some service to the industry generally—more especially as it carries with it a seat on the Council of the Institution of Gas Engineers. My only regret as to the latter position is that the period of service is so short as to allow for no more than merely getting a grasp of the various important questions coming before that body.

In considering the subject of his address, a President must always be confronted with a certain amount of difficulty as to whether he should discuss questions of policy relating to the industry generally, or bring before the members a technical subject or subjects, the latter preferably being within his own experience. I propose to adopt the latter course, keeping in view that this is a technical association, founded for the purpose of presenting and discussing technical questions, and the fact that we now have the National Gas Council and other bodies who so efficiently deal with questions of policy, legislation, &c., from a national standpoint. Notwithstanding this view, I feel that I must deal, necessarily in the briefest possible manner, with the position of the gas industry in its relation to the proposed subsidizing of the electrical industry, because I know that my remarks, endorsed as they will be by the Association, will reach a public in this and surrounding districts that is not reached by technical journals.

Position of the Gas Industry.

The gas industry is under a deep debt of obligation to Mr. Milne Watson for his brilliant advocacy of the case for gas in opposition to the proposed Government scheme of electrical development; and I would specially mention his address to the Society of British Gas Industries on May 20 last, from which address I have taken the liberty of quoting freely. As you are aware, the gas industry has made extraordinary progress within recent years; and when it is kept in mind that these years cover periods of high charges for gas, persistent bad trade and unemployment, and keen electrical competition, the increased output is the more remarkable.

The sales of gas in Great Britain in 1902 amounted to 160 thousand million c.ft., and by 1923 these sales had increased to no less than 274 thousand millions—a truly phenomenal increase, and one that shows the appreciation by the public of the ability of the gas industry to meet its needs, in the industrial and the domestic spheres. This increased business naturally leads to more employment; and as the gas industry employs more than five men for every one that the electricity industry employs for the same output of heat energy, it follows that our industry's contribution towards providing employment has been of no mean order.

It is being urged that cheap electrical power would be a cure for the evil of unemployment; and yet on the North-East Coast of England, where there are the largest super-stations in this country, belonging to an electricity undertaking probably as up-to-date and efficient as any in the world, and supplying current over a large area at very low rates, the depression of industry is as great as, if not greater than, in any other part of the country. Although the industries of that district have freely availed themselves of this cheap supply of power, it has not lifted them out of the trade depression, for the simple reason that power represents too small a proportion of their total working costs. In shipbuilding, marine engineering, locomotive building, and iron foundries, the cost of power represents under 1½ p.ct. of the total working costs; while in a representative engineering works it has been ascertained that power represents only 0·8 p.ct. of the total manufacturing costs. From this it is evident that it is not high power costs in this country that are the cause of trade depression, and that even if power were supplied free no appreciable contribution would be made towards a recovery of trade. We have only to quote the instances where British shipowners have placed orders for ships with foreign yards, at prices much lower than British tenders, to learn that something more than cheap power, electrical or otherwise, is needed to cure the present depression in industry.

The general public has a totally erroneous idea of the relative magnitude of the gas and electrical industries; and in this connection I need only mention that the Gas Light and Coke Company (London) alone supply a greater number of heat units than the heat equivalent of the electricity sent out by the whole of the electricity undertakings of Great Britain, and that the capacity, in heat units, of the super-power station recently opened by His Majesty the King at Barking, of which so much was made in the newspapers, is only equal to the extension required annually by the largest London gas undertaking to meet its normal increase of business.

The opposition of the gas industry to the proposed subsidizing of its rival is in no sense in the spirit of "the dog in the manger," but is conceived entirely from the view that the granting of subsidies to industry is wrong in principle—especially when, as in this case, one industry would be helped at the expense of another in practically the same line of business. That the electrical industry is in no need of help, is shown by the dividends paid by the leading companies. All we ask is that each industry should have a fair field and no favour, and be allowed to work-out its development along lines to be decided by its administrators; and as it is a subject which closely concerns the municipalities of Scotland (interested as they are so largely in the gas industry), it is hoped that they will take concerted action to bring before Members of Parliament their views on this important matter.

Reconstruction at Dunfermline.

The output of gas in Dunfermline for the year 1918—the year in which I took up duties there—was 205 million c.ft.; and as it has since risen to 355½ millions, it will be evident that very considerable extensions and reconstruction, both in the works and in the distribution department, have had to be undertaken.

The carbonizing plant at that time consisted of both horizontal and vertical retorts, the latter being built to the designs of my predecessor; and as these were unequal to the demand for gas, which was rapidly increasing, and were uneconomical in operation, my first duty was to advise as to how this problem should be met. It was decided to scrap the existing plant; and in April, 1919, a contract was placed with the Woodall-Duckham Company for the erection of twenty 5-ton retorts, complete with house, electric generating plant, coal and coke conveyor, coal breaker, wagon tippers, &c. This plant was put to work in August, 1920, and has given the greatest satisfaction, working with the utmost regularity and smoothness; and as the whole of these twenty retorts were in operation for a short period last winter, a further contract

has recently been placed with the same firm for an extension, consisting of a complete house, containing only eight retorts meantime, and with a hoist and coal and coke handling plant. This work will be commenced during the current month.

Only local coals are used for gas making; and these are well adapted for working in vertical retorts, being only slightly caking, and giving a good yield of gas, coke, tar, and ammonia. Our working results, since starting with vertical retorts, are given in the following table. (The year ended May, 1921, has been omitted, as it did not include a full year's working, and, in addition, covered the coal strike period.)

Year Ended	Yield per Ton.	Therms per Ton.	Coke Sold per Ton.	Tar Sold per Ton.	S./Ammonia Sold per Ton.
	C.Ft.		Cwt.	Galls.	Lbs.
May, 1922 . . .	16,530	73·33	7·35	16·92	27·36
,, 1923 . . .	17,448	76·28	7·58	18·97	31·82
,, 1924 . . .	17,228	74·93	8·33	18·13	30·13
,, 1925 . . .	17,153	74·27	8·20	18·58	29·09

The fact of having a rapidly increasing output, coupled with a minimum daily consumption equal to nearly 70 p.ct. of the maximum, has enabled the carbonizing plant to be worked economically, as is shown below.

Year.	Carbonizing Wages per 1000 C.Ft. of Gas Sold.
	Pence.
1920	7·95
1922	2·87
1923	2·13
1924	1·91
1925	1·95

This figure of carbonizing wages includes all men engaged in the retort house, conveyor man, emptying of coal wagons, and removal of coke—in fact, all charges from coal in wagon to coke into storage hoppers or to yard—and in addition it includes one-half of the wages of the work's foreman and the engine-house attendant, and also one-third of the boilermen's wages, all these items being in my opinion chargeable to carbonizing.

Features of the Output.

Mention of our minimum output leads me to digress for a moment, and to place before you a chart comparing our output on Tuesday, Dec. 30, 1924, with that of Tuesday, June 23, 1925.

Several interesting factors in present-day gas supply are there indicated.

(1) The importance of the lighting load, as shown by a comparison of the outputs between the hours of 6 p.m. to 10 p.m.

(2) The extent to which gas is used for cooking, each meal time having its distinctive peak.

(3) The maximum hourly output now occurs in summer, and in our case is equal to over 12 p.ct. of the day's output.

(4) The necessity of having mains of sufficient capacity to deal with the peak *hour*.

(5) In summer there are 13 hours, and in winter 14 hours per day, during which the output exceeds, or is equal to, the hourly average make required for that day's output.

It will be noted that the daily output in summer is equal to 67 p.ct. of that in winter.

Details of Work Done.

The demolition of the old horizontal and vertical retorts left us with an excellent house, except for the roof; and as this house was in a convenient situation, and easily adapted, it was converted into our coal store No. 2. The floors over the existing underground passages in this retort house were rebuilt, thus forming two tunnels into which coal could be delivered on to skips. The horizontal retort bench, which formerly stood between these tunnels, was partly demolished so as to leave an inverted "V" in the centre. This rough brickwork was covered with concrete finished smooth, and thus was formed a hopper-bottomed coal store, from which coal is very easily withdrawn, practically without trimming, into the tunnels previously mentioned. This coal store was divided by three cross walls, giving four divisions; the cross walls forming a support on which was built a gangway extending the whole length of the house, and placed in the centre.

Loaded skips of coal from the railway siding are run along this gangway and tipped into the store, the whole arrangement providing a very convenient and cheap method of handling coal. The tunnels extending under this and another adjoining coal store are connected with hoists, and are extended underneath the coke yard, and provided with suitable openings; and over this yard the coke will be distributed by means of band conveyors to be installed shortly, so that coke can be deposited on to, or lifted from, the yard with the minimum of labour.

The exhauster house next demanded attention, as, while there were three exhausters, two of these were now too small to deal with even the summer load, so that we had no stand-by. A steam-driven exhauster of 100,000 c.ft. per hour capacity made by the Bryan Donkin Company was installed, and the positions of the various exhausters and compressors re-arranged so as to provide for further extensions. At the same time a small compressor was discarded and replaced by a horizonal steam-driven reciprocating duplex set, also by the Bryan Donkin Company, having a capacity of 50,000 c.ft. per hour against 20 lbs. per sq. in. pressure, and controlled by a regulator operated by the outlet pressure of the compressor. There again, a re-arrangement of positions and piping was made, so that the provision of further compressing plant will be comparatively easy.

This house now contains two exhausters, each of 100,000 c.ft. per hour capacity, three compressors (one of 50,000 c.ft. capacity operating at a pressure of from 4 to 12 lbs. according to demand, and two of smaller capacity), and two hydraulic pumping engines for hoists, wagon tippers, &c. The exhaust steam from these engines is utilized as far as possible for the heating of boiler feed water; but there is a considerable surplus which is discharged through two pipes having exhaust heads fitted. The lack of this simple provision had resulted in the almost complete destruction of the engine house roof, necessitating the renewal of both wood and slate work, whereas the roofs are now in perfect condition, and there is an entire absence of the usual hot spray in the vicinity of the engine house.

The installation of a 2 million c.ft. per day Livesey washer, replacing a tower scrubber and a Walker purifying machine, completed the reconstruction of the gas-making plant.

Storage Accommodation.

The question of gasholder accommodation was at this time somewhat acute, as we had storage for only 500,000 c.ft., the

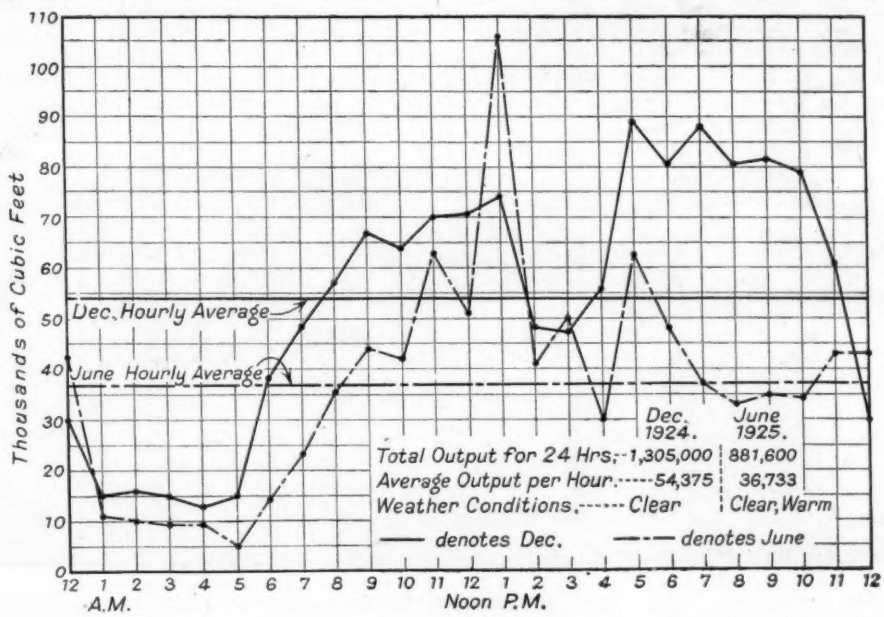
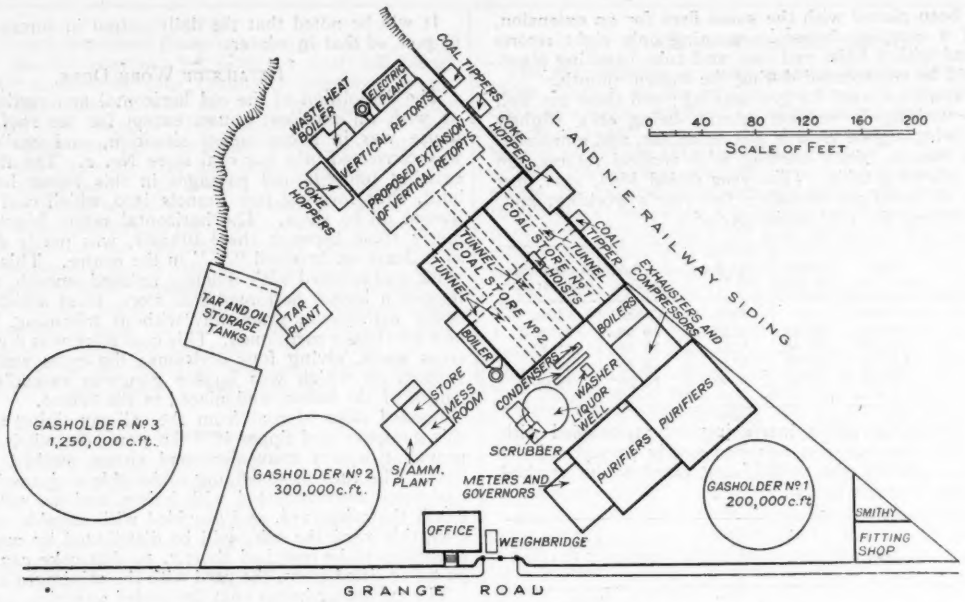


FIG. 1.—HOURLY OUTPUTS OF GAS PER DAY IN DECEMBER AND JUNE.

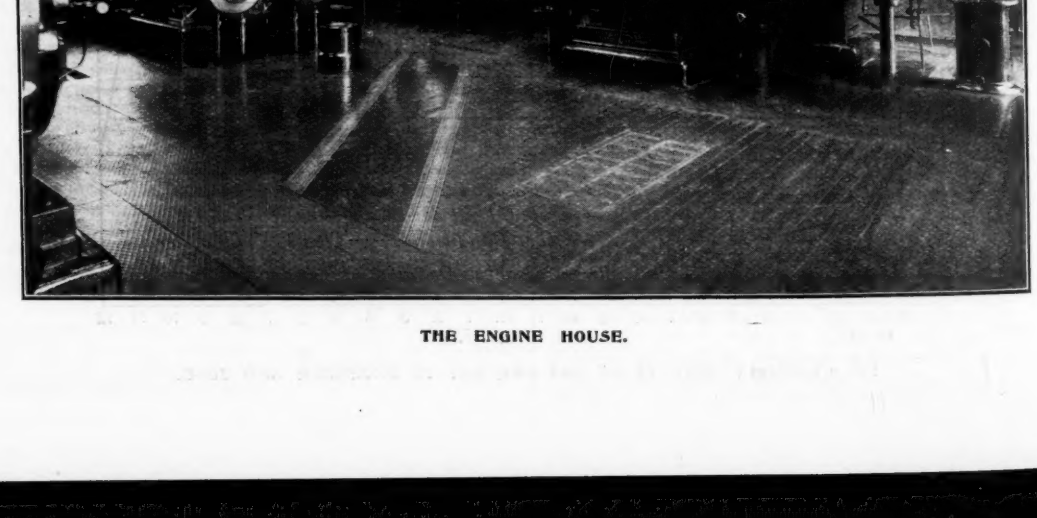


PLAN OF THE DUNFERMLINE GAS-WORKS.

last 100,000 c.ft. of which was of limited use, owing to the low pressure thrown by the last lift of one holder, and our output was approaching 1,250,000 c.ft. per day. The question of how much storage should be provided is often debated on what I may term purely theoretical grounds; but in practice it cannot be denied that ample storage tends towards economical working. In studying our chart of maximum output, it might be argued that works of our size could be carried on with half-a-million storage; but, in so doing, no account is taken of exceptionally heavy outputs, long spells of dark weather, breakdown of machinery, and last, but not least, the freedom from anxiety of those in charge.

The engineer who is almost constantly worried by watching the plates and rivets disappear, cannot possibly run his works in a smooth and orderly fashion; nor can he get the best out of his men or his plant, when these have to be adapted to meet the varying demands for gas, instead of working to a definite "make," and allowing the gasholders to take care of the fluctuations. These remarks apply specially to those works having vertical retorts, where a single retort is, comparatively speaking, a fairly large unit. In our case we never had a complete week in which the same number of retorts was working through the period, as retorts had invariably to be shut-down for the week-end and restarted on the evening of Sunday-Monday. This, of course, is bad for both plant and results, and, in addition, means a greater number of retorts under fire than is really necessary. The provision of ample gasholder accommodation allows for the working of only such a number of retorts as will, in a week, provide the necessary gas, whereas formerly the number of retorts under fire had to be equal to the highest daily output.

In proposing to a committee the erection of an additional gasholder, one cannot, as in the case of (say) vertical retorts, reduce the question to £ s. d.; but I felt convinced that, in our case at least, there were substantial economies to be effected, and in this I was not disappointed. The coke available for sale was increased by 0·75 cwt. per ton of coal carbonized (from 7·58 cwt. to 8·33 cwt.)—itself no mean saving on a consumption of 19,658 tons of coal per annum, with an average price for coke that year of 32s. 8½d. per ton—and, in addition, retorts



THE ENGINE HOUSE.

were seldom let-down except for scurfing, which must tend to lengthen the life of the plant. (While the sales of coke per ton for 1925 were down to 8·2 cwt., this is really due to a conservative estimate of coke stocks, whereas in the previous two years we had no stock whatever.)

The erection of a spiral-guided holder of 1¼ million c.ft. capacity, in steel tank wholly above ground, was entrusted to Messrs. R. & J. Dempster, and was completed in little over a year. This holder was erected on ground belonging to the Department, adjoining the works; but the valves were placed in the works, and adjacent to those of our No. 2 gasholder.

Sulphate Making.

The sulphate of ammonia plant has been entirely reconstructed, including a new saturator and centrifugal dryer; and we now produce a salt that is much appreciated by local buyers.

Within recent months we discarded the steam sulphate ejector, as it was found that salt so discharged was inclined to be of a sloppy character, the crystals were damaged and rendered smaller, and the salt was rather more difficult to dry. Our workmen prefer hand-fishing, and we certainly have a better product by this method. We have found by experience that sulphate should not be discharged direct from the saturator to the centrifugal drier, but should first be placed on a draining table, and only passed into the drier after the greater portion of the liquid has drained off. By this means a better drying effect is obtained. The cost of renewing the fine copper gauze of these driers is an expensive item; and to get over this we have adopted ordinary sacking, such as is used for sulphate bags. This is hung on a ring at the top of the basket, and serves the double purpose of preventing sulphate leaking through the larger holes in the basket, and facilitating removal of the salt without damaging the copper. After whizzing sufficiently to remove the bulk of the acid, we spray the sulphate with water, heated and sprayed by means of a steam ejector lifting a definite quantity of water from a vessel adjoining.

Steam Raising by Waste-Heat Boiler.

The raising of steam in a gas-works is an item the cost of which is, I am afraid, often imperfectly known, and when closely investigated provides food for thought. Our plant consisted of two small Cornish boilers, maximum pressure 60 lbs., and one Lancashire boiler, working pressure 100 lbs. The Cornish boilers were unequal to carrying the load in summer, even with the sulphate plant off, and we could not work all three boilers at once. The cleaning of the Lancashire boiler, necessitating the use of the smaller boilers, was always a trying time, and in addition the Lancashire boiler was unduly pressed in winter.

The question of further boiler power naturally led me to consider the question of a waste-heat boiler; and last year a contract was placed with the Woodall-Duckham Company for an installation. The main waste gas flue in the retort house was thoroughly overhauled and insulated, and the flue leading to the boiler was insulated with Moler bricks and slag wool. The fan is driven by a high-speed steam engine, the exhaust of which is used for the heating of feed water, which is maintained at an average temperature of 205° Fahr. The feed pump is controlled by a "Thermo-Feed" regulator, which maintains a very steady water-line; and this, combined with mechanical lubrication of the fan engine, and high and low water alarm, dispenses with the necessity for constant supervision. The steam drive for the fan was specified in preference to drive by electric motor, as being much cheaper to run and giving the advantage of hot feed water. I also much prefer our arrangement with the engine and fan on ground level, instead of, as is usual, on the top of the boiler outlet casing, as it makes supervision and repairs more certain than when an attendant has to climb for his periodical visits.

This boiler has been in use since January last, and has proved most successful. For our Lancashire boiler we had previously to purchase small coal for steam raising, costing about £1300 per annum, in addition to which we used considerable quantities of coke and breeze; whereas we now consume only small breeze, for which we have no other outlet. The waste-heat boiler is supplying between 60 and 70 p.ct. of our whole steam requirements, this proportion varying according to circumstances. The installation of mechanical draught on our settings has resulted in a distinct improvement, there being no variation due to weather conditions; and there are other advantages of which no account was taken when the question of installing such a boiler was considered.

At the period of smallest demand, we had last summer ten retorts in use, necessitating three producers working, and in ordinary circumstances this must lead to a considerable waste of heat; but with the recovery of this surplus heat in the boiler, a distinct saving is effected. During a portion of the past summer we put an extra producer under fire, and used in it small breeze and coke of a size that is, under existing conditions of the coke market, difficult to sell, and of which we had a large quantity, due to the stocking of coke during last winter. By admitting only a small quantity of secondary air to this bed, low heats are carried, a large volume of producer gas is taken forward in the waste gas flue, and the bed is ready for use at a few days' notice. It was really a case of heating-up a bed considerably in advance of its usual time; but it proved a very economical method of steam raising. Our short experience in this respect would make it appear to be worth consideration whether producers of large capacity might be designed for incorporation in vertical settings, these producers to use unscreened coke containing a large percentage of breeze, and the excess gas produced to be led by a separate flue direct from the producer to the waste gas flue for use in a waste-heat boiler. It should then be possible to dispense entirely with the ordinary works boilers—resulting in economy in steam production and lower capital costs, due to the elimination of boiler settings, chimney, &c.

"T.I.C." Tar Plant.

The only other item I would mention in connection with the works is the installation of a tar dehydration plant on the "T.I.C." system, supplied and erected by the Woodall-Duckham Company. This plant is well known, and needs no description; but I would here record that the lead-bath process leads to remarkably easy working and control of temperatures. As the plant was only started last June, it is too early yet to speak of financial results; but my short experience leads me to believe that these will be of a very satisfactory nature.

The question of ample storage for crude tar and tar products for such a plant is of the greatest importance, if the best financial results are to be obtained; and I therefore decided on a reinforced concrete tank, having a capacity of over 150,000 gallons of crude tar, 50,000 gallons of dehydrated tar, and three sections each of 10,000 gallons for oils. There is a disinclination in many quarters to use concrete for such a purpose; but I believe that leakages are often due to the tanks being used before the concrete is sufficiently dried and set. If oil or tar is allowed to permeate through imperfectly dried concrete, then the concrete can never set, and a permanent leak is caused; but in our case the tank was completed ten months before it was put into commission, and in addition the oil tanks were rendered with a solution of silicate of soda just before use. The result has been eminently satisfactory. Very few leaks have occurred, and such as are evident are extremely small and of no account.

The tank, designed by the Trussed Concrete Steel Company, is 60 ft. square and 11 ft. deep, the top being level with the works yard, and made to carry ordinary traffic. As three sides of the tank are exposed, any leaks are easily observed. A chamber was built alongside the tank, and roofed in, and all pumps were placed therein at the level of the bottom of the tank, so that the pumps are fed under pressure of the head in the tank. The crude and dehydrated tar storages are provided with steam heating by means of welded pipes, rendering it easy to run prepared tar direct into barrels at the lower level or to pump it into tanks on the upper or yard level. Advantage has been taken of the different levels in the works yard to arrange for barrels being filled from storage at the upper level, and then rolled on to a loading bank adjoining, from which motor lorries can be loaded without any lifting of barrels.

A plant for the preparation of mixtures of dehydrated tar and bitumen has also been installed; the bitumen being melted by the waste heat from the tar still, and the hot tar and melted bitumen running into calibrated tanks for mixing. Gas-works must make provision for supplying such mixtures, as there is a distinct demand at present for these preparations.

Distribution.

On the distribution side of our business we have a fairly extensive area, a large proportion of which is supplied under high pressure; and some of our successes and failures in this department may prove of interest.

Our largest area supplied under high pressure is that of Rosyth, comprising some 1600 houses wholly occupied by employees of one of the greatest of British Naval Dockyards. In 1918 this area was served by means of high-pressure supplies laid through a large part of the district, and a number of governors controlling the various streets and sections. The governors, however, were of a type totally unsuitable for the conditions under which they were required to operate, as they were designed to carry an inlet pressure of not more than about 12 in. It had evidently been intended so to run the compressors as to maintain approximately this pressure at the inlet of the governors; but this I found to be a hopeless proposition. On occasions a pressure of over 12 in. was found on consumers' premises; while at other times there was absolutely no gas whatever in certain districts at times of greatest demand. It was therefore decided to reorganize the whole scheme of supply; and for this purpose all the sectional governors were cut out and a Reynolds governor, in duplicate, installed to control the whole district. In the carrying out of this work must be recorded one of our failures.

The site for this governor was given very careful consideration, principally from the point of view of ensuring that the distribution of low-pressure gas should be as equal as possible over the area; but it turned out to have the fatal defect that it was liable to flooding. The governor was placed in a pit just off the main road; but in wet weather we had it on several occasions wholly immersed in water, with very awkward results in governing. Removal was decided upon, and another site was found; and as at this point a corner shop was being erected, it was arranged that the Gas Department should build a sunk

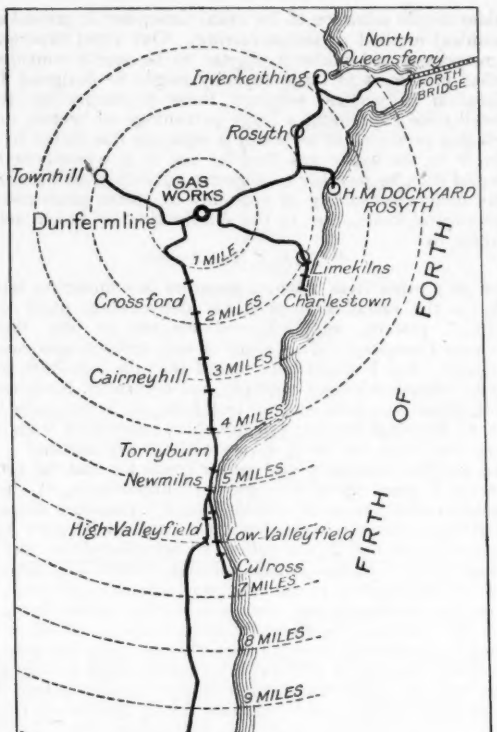


Fig. 2.—Plan of Supply Area.

chamber underneath the shop and instal the governor therein. This chamber is perfectly watertight and well drained, ample provision is made for ventilation and lighting, and it is large enough to serve as a district store for fitters. Work can be carried out here under all weather conditions; and repairs and supervision, and the taking of charts, are much easier to accomplish than in a pit in the road. This site had the further advantage that the outlet from the governor led direct into an 8-in. main running through the centre of the district.

The above alteration led to a great improvement in supply conditions; but still it was found that certain districts were short of pressure at cooking times. This was due to the large number of dead ends in the system; and it was therefore arranged to connect-up the whole of these, thus ensuring that every street and section was fed from both ends. This district is laid out on Garden City lines, and it was natural in the first instance to leave the dead ends referred to; but we were faced with the difficulty that mains which were formerly carrying high-pressure gas were now used for low pressure, and were therefore inadequate if supplied from one end only. The final result has been that Rosyth has an excellent supply and ample pressure at all times over the whole district.

There are some peculiar circumstances attending the supply of gas in this area. First we have the fact that practically every one of the 1600 houses has a cooker, and uses it, and the demand during meal times is exceptionally heavy, especially during Sunday forenoon. Yet at other times of the day the demand is practically *nil*, and as nearly all the houses are lit by electricity it is in the evening very small indeed. The public lighting, however, is by gas, and creates sufficient demand to prevent any banking-up of pressure, in the event of the governor valve not closing-up completely. But in the early mornings in summer, when there are no street lamps in use and no demand exists from the district, we have had cases of high pressure creeping past the governor, due to very slight accumulations of rust on the governor valve face. It is, of course, no easy matter to get over this difficulty, which only occurs in summer; and although the obvious remedy would be to reduce the pressure at the works, this is meantime impracticable, as the compressor serves other districts which require more pressure than Rosyth. A district such as this, where gas is used almost wholly for cooking, and very little for lighting, offers distinct difficulties in supplying under high pressure; but we can claim to have successfully overcome these, and to be in a position to say that the supply is now completely satisfactory. The Naval Dockyard is furnished with gas from the same high-pressure main, the pressure being controlled by a governor placed immediately in front of the meter.

Our main is extended for fully a mile beyond Rosyth to the Burgh of Inverkeithing, where the gas-works are now shut-down, and a supply is given in bulk to the Gas Company. A governor is fixed prior to the station meter, and the gas is then fed into the holder for distribution. The valves on this governor are only opened sufficiently to pass such a quantity per hour as will maintain the supply in the holder; and it often happens that this rate of flow is not altered for weeks at a time. This arrangement is very suitable for our works, and is also a convenience for the man in charge at the other end.

Supplying Outlying Districts.

Attention was next given to a district comprising six villages and one small burgh, Culross, which were served by a pipeline under a pressure of about 10 in., controlled by a governor placed on the main not far from our works, and having governors attached to each meter. This system had worked fairly well for some time; but colliery developments at the far end caused a considerable increase in house building, several hundreds of dwellings being erected within a short time, and after these were connected-up the pressure was found to be inadequate. As a temporary measure, the governor at the works end was loaded up until a pressure of nearly 18 in. was given; but this soon landed us in a difficulty, as the small governors on the meters were useless under this pressure. Excessive pressures were found in the first two villages on the route, while the most important—that at the far end—had pressures varying round about 1½ in. during lighting hours.

Various schemes were considered as remedies, including the laying of governed low-pressure mains in each village; but this was ruled out, principally on the question of cost. These villages are all long and straggling, have no side streets, and there is only a comparatively short distance between each; so that such a proposition would have involved low-pressure mains of nearly the same length as the existing high-pressure mains. It was therefore decided to supply the district for its full length from the high-pressure main, and to govern each service individually; but a problem presented itself as to how to serve the district during the alterations. If we had started at the first village, and fixed a high-pressure governor on each service, then the available pressure would not have been sufficient to allow of an adequate supply passing the governors; while if we had increased the pressure sufficiently to serve this village, then those further on would have had a dangerously high pressure. In consultation with the Bryan Donkin Company, it was arranged to enlarge the inlet aperture of the governors, so as to pass sufficient gas at the available pressure; and this solved the difficulty. The arrangement, however, had the defect that, in the event of a governor failing from any cause, a large quantity of gas could pass at high pressure; and to obviate any danger from this cause, each governor was placed in a small pit in the footpath or other convenient position outside the building.

This system, comprising 241 governors of various sizes, operated with an inlet pressure varying between 4 and 12 lbs., and set to give an outlet pressure of 4 in., has been used for the past three years, with excellent results, and has given the minimum of trouble. My own house is served from one of our high-pressure mains, with a governor fixed on the service pipe; and I can speak from personal experience as to the satisfactory nature of such a supply. The ample pressure behind the governor enables any demand to be met. I can turn on a geyser and several gas fires without causing more than a momentary drop in pressure, or the slightest difference in the lighting.

Service and Governor Records.

It is obvious, of course, that such a scheme involved very careful records of the position of services and governors; and considerable thought was given to this question. Any form of records must be available for instant reference over a long period of years, and it was recognized that merely names and addresses would soon be out of date, and finally become complicated. It was therefore decided to compile an index (fig. 3),

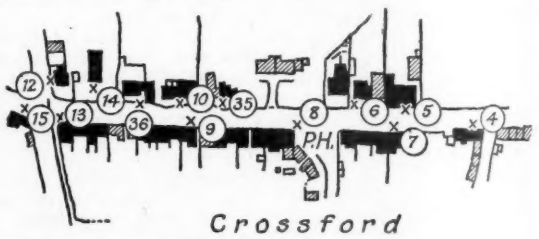


Fig 3.—Governor Index.

consisting of a copy of the ordnance survey map of each village, constantly kept up to date; and on this map each house that has a gas supply is coloured red, and has a number attached. The map is bound in a loose-leaf book, and behind the map are placed sheets (fig. 4) bearing numbers corresponding to the numbers on the map, there being as many sheets as there are governors.

To ascertain the details of the supply arrangements to any building, or group of buildings, we first find the house on the map, and its number. Then we refer to the sheet bearing this number, and on that sheet is recorded, by sketches, the position of the service, governor, and pit, and their sizes, together with any details as to tees or other connections left available for

supplies required at a later date to other houses. By this system, it will be noted, no record need be kept of consumers'

GOVERNOR No. 8. Size of Governor: ¾" Horizontal. Size of Service: 1" off Main. Premises Served: Public House and 5 Houses, S. Side Road. Pit: 1' 3" Deep. Covered by: Concrete Slab.

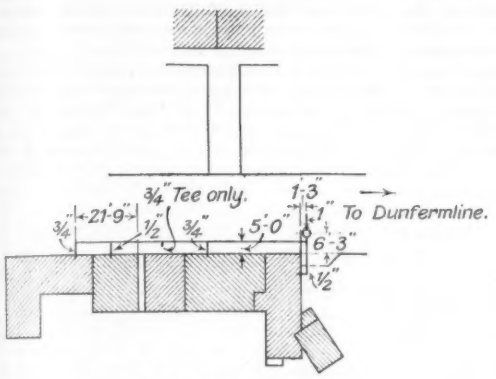


Fig. 4.—Governor Details.

names, and the numbers of the governors in any street need not be consecutive, but can be in any order without disturbing the facility of reference.

A somewhat similar system has been adopted for all main and service pipes during the past five years, whether high or low pressure. First we have a key plan (fig. 5) to the whole district of supply, on a small scale; this plan being marked-off into divisions corresponding to the appropriate survey sheets. Inside these divisions on the key plan is printed the number of the survey sheet, and these sheets are stored in a vertical file in such a way that any single sheet can be consulted without in any way disturbing the others. These plans contain all mains and services laid, and their position and depth; but where there are streets crossing, or where any particular difficulty has

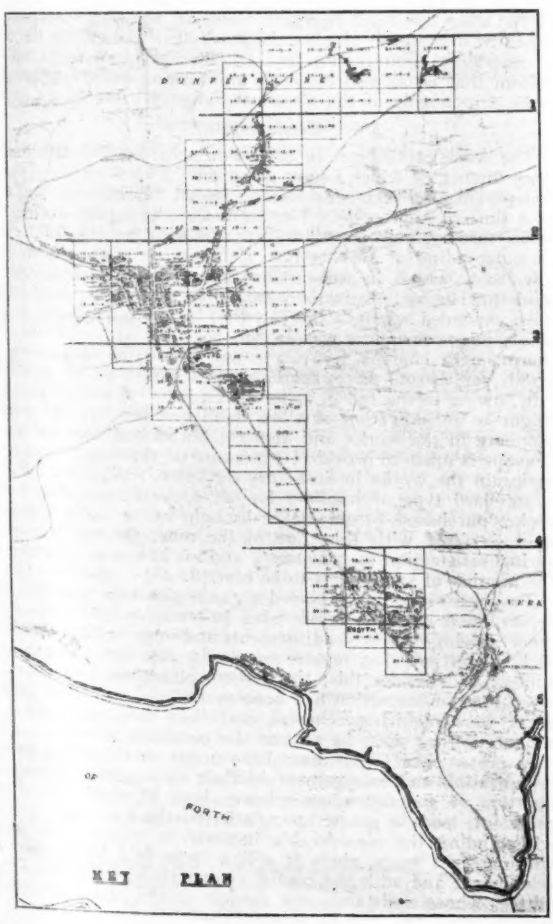


Fig. 5.—Key Plan.

been encountered, a special large-scale record is prepared of that section, and a reference made on the plan denoting that a detail of this section is available. These large-scale records of special sections are filed alphabetically in a loose-leaf book, so that all records obtained in any street can be placed in their proper sequence, although many years may elapse between the dates when the records were obtained.

To give an actual example of how the system works, we will take the case of Moodie Street, recently reconstructed with a concrete foundation, where a portion of the mains was relaid and all services renewed. We learn from the key plan which sheet contains Moodie Street, and in reference to that sheet (fig. 6) we see recorded the positions of two main pipes and the services; and at a point where we had some difficulty in crossing another gas main, we find marked "Detail at M." In the

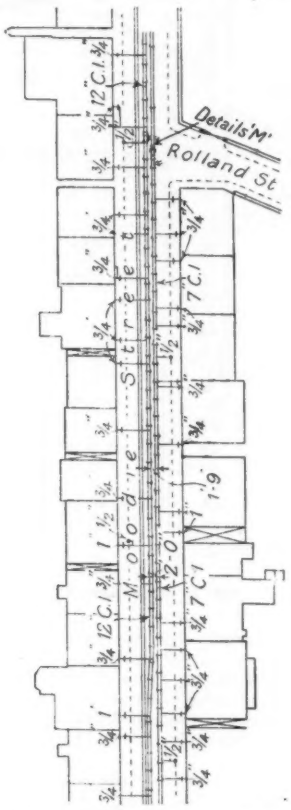


Fig. 6.—Portion of Street Plan.

loose-leaf book, which is indexed, we see, under "M," a sheet (fig. 7) giving all details of this crossing; and also under "M" we find, in their appropriate place, details of a connection made in this street thirty years ago, of which, fortunately, a record had been kept. Although our record of mains is very imperfect, especially of those laid within the past twenty-five years, it is possible, under this system, gradually to build-up a complete record of all details by merely inserting a loose leaf at its appropriate place.

OTHER HIGH-PRESSURE PROBLEMS.

Of those districts supplied under pressure, the next requiring attention was that of Limekilns and Charlestown. This is a totally different area from that previously described, in that there are two villages, quite apart, each village consisting of groups of houses only a small proportion of which are on the main road. The district had governors for each section or group of houses; but these could only deal with an inlet pressure up to 12 in. It was, however, served from the same compressor as other districts which required a higher pressure, so that the system broke-down; and it was therefore decided to instal, at our works, a Reynolds governor to control the supply to the district. For fully a year this worked fairly satisfactorily; but the demand increased to a point where the 12-in. outlet pressure from the governor was insufficient to meet the demand some 3 miles away. So it was arranged to transfer this high-pressure governor to a point immediately before the first village on the route, and thus convert the main for 3 miles to a high-pressure main. The governor is set to an outlet pressure of 10 in., and each group of houses has, as before, its own governor, governing down to 4 in., resulting in a system that resolves itself into breaking-down the pressure in two stages, which, while perhaps not ideal, has worked perfectly satisfactorily, and is the best adaptation that could be made of the existing pipes and governors.

There is a detached portion of our own burgh, Townhill, served by a 4-in. low-pressure main laid rather more than forty years ago. This district has grown considerably in recent years, and more particularly the area through which passes the

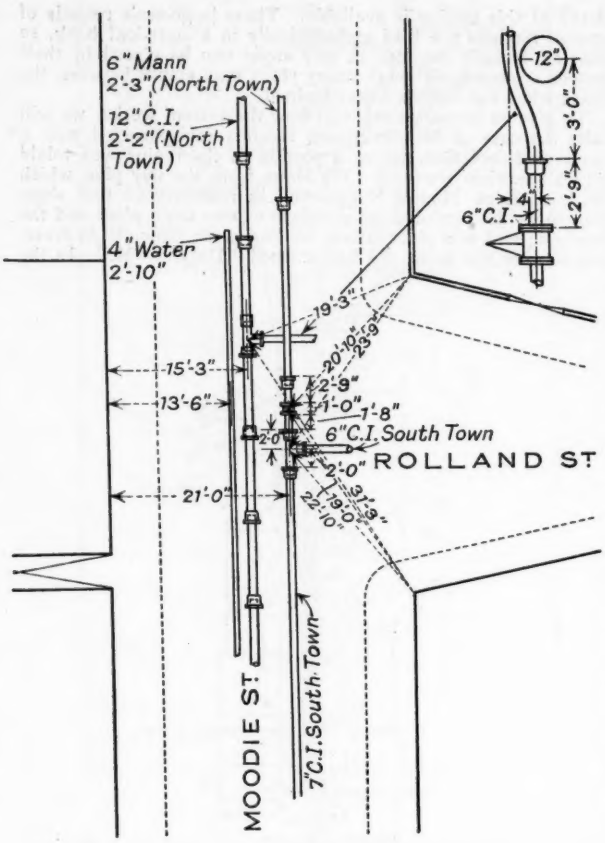


Fig. 7.—Mains Details.

main leading to Townhill, with the result that some three years ago we found very defective pressures there during times of heavy demand, while during times of low demand the pressure rose unduly, owing to the elevation of the district. The problem to be faced was that of restricting the pressure at certain times, and at others increasing it; and this was overcome in the following manner.

An ordinary low-pressure governor was fixed on the existing main at the beginning of the village, which is the highest point of the route, and the outlet pressure set at 3½ in. An existing high-pressure main was extended for a distance of rather over a mile, and this feeds into the low-pressure main just beyond the low-pressure governor, at a pressure of 3¾ in. During times of heavy demand—that is, over the mid-day cooking period, and at lighting times—a high-pressure supply is turned on at the works, resulting in the shutting-down of the low-pressure governor and the supplying of the district solely through the high-pressure main; while at other times the low-pressure

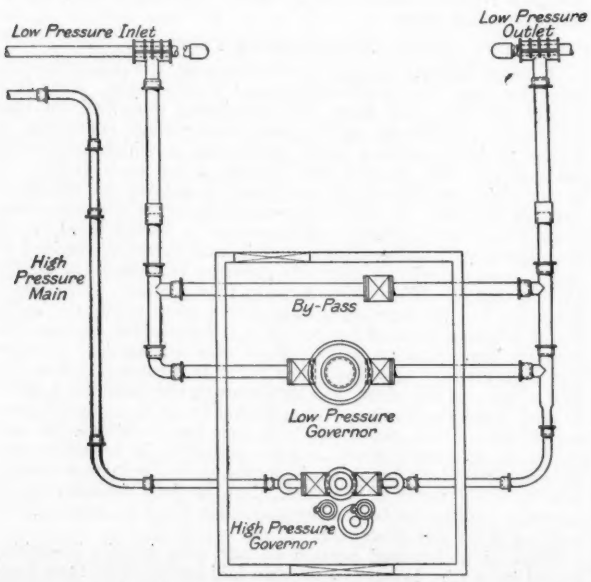


Fig. 8.—Townhill Governors.

governor comes into action and feeds the district from the low-pressure main. This system has the further advantage that the district served by the low-pressure main, before reaching Townhill, has an improved supply, due to the fact that Townhill's requirements during the heaviest periods are met from the high-pressure main. The arrangement has worked most successfully over the past two years. The high-pressure main from which this district is supplied passes through the principal streets of the town, serving high-pressure street lamps and other consumers on the route; and it is available as a feeder to the town should this be required at a later date.

The only other section I would mention is that of Kincardine, 11 miles away, where the existing gas-works were shut-down and a supply taken in bulk, exactly as was done in the case of Inverkeithing. In this case it involved the laying of 5 miles of main; and this was carried out in steel pipe with welded joints. This jointing has proved so satisfactory in practice that in any future schemes I shall certainly be difficult to convert to any other form of joint; and in this connection might I say that I have used lead wool with ordinary and with rigid joints, lead wool with double collar joints—that is, lead back and front and yarn between—also cast-lead joints, and welded joints. I would place welded joints first, with the lead wool double collar joint a good second; but if anyone should contemplate using cast-lead joints for high-pressure work, I would simply say "Don't." A short section of high-pressure main laid some three years ago, in which we used cast-lead joints, has given us continual trouble through leakages; and often the same joint has had to be repeatedly examined and caulked, notwithstanding the greatest care being taken, and a strict test being made under high-pressure air during the original laying of the pipe.

High-pressure distribution is particularly adapted to a district such as ours, where a town is surrounded by smaller towns and villages, enabling those districts to have the benefit of a gas supply, which would otherwise have been unobtainable, or, if obtainable, at a prohibitive cost. Last year our charge to consumers in these outside districts (except Rosyth, which is within the burgh boundary) was 3s. 6d. per 1000 c.ft., or 9·76d. per therm, a figure quite beyond the reach of a village gas-works; while in the case of bulk supplies to existing gas-works the charge has been reduced in one instance by no less than 3s. per 1000 c.ft. since we took over the supply. The sales of gas from our high-pressure system last year amounted to 87,264,000 c.ft., or 27 p.ct. of our total (a factor of considerable importance in reducing overhead charges); and, in addition, we have a practical illustration of what the gas industry can do in the way of centralized manufacture and distribution over large areas—a system that is claimed by some uninformed writers at present to be a monopoly of the electrical industry.

CONCLUSION.

The work carried out in the manufacturing and distribution departments, of which I have given only a bare outline, has, of course, entailed very considerable capital expenditure, and this at a time of high costs. The amount so expended during the years 1920-25 inclusive was £111,958, making the total capital outstanding at May 15 last £169,755, or £520 per million c.ft. sold, which in the circumstances may be considered a moderate figure. A further indication that the Corporation have expended wisely is the fact that last year our price of gas to ordinary consumers was 2s. 6d. per 1000 c.ft., or 6·98d. per therm, with charges for power and industrial uses down to 4·18d. per therm—prices increased last month by 4d. per 1000 c.ft., owing to the fall in value of residuals. Low price of gas might be an indication of a low quality of service, and a false economy in the works and district; but in our case every endeavour is made to provide for consumers' requirements, and to maintain the works in first-class condition. We have adopted a standard type of hotplate for all cookers; and every new cooker purchased, or old cooker brought in for repair and overhaul, is fitted with this, one of the most modern types—ensuring satisfaction to consumers and an immense reduction in the number of spare parts to be carried.

Two years ago we employed a gas engine expert to visit and report upon all gas engines used in our area. A copy of his report, giving details of adjustments and improvements effected, and suggestions for repairs required, was sent to each consumer; and besides this, the makers of each engine were advised that an inspection had been carried out, and that certain parts were requiring renewal, and they were requested that a quotation for these be sent to the consumer direct.

At present the Department have under consideration the reorganization and enlargement of their showroom and also the question of a maintenance scheme, both of which will, I am confident, lead to greater popularity of the gas supply. Notwithstanding the considerable increase in output experienced within recent years, there is still a large field for further development; and with the cordial co-operation of the Gas Committee, whose assistance and support in the past I gratefully acknowledge, this can be accomplished.

The gas industry has immense possibilities before it—possibilities of greater public service, possibilities in the matter of smoke prevention and coal conservation, and possibilities both in the industrial and domestic spheres—and if those engaged in the

industry are imbued with the right spirit, that of "service," all these possibilities, and more, can be realized, with lasting benefit both to the general public and ourselves.

THANKS TO THE PRESIDENT.

Mr. JOHN WILSON (Motherwell) moved a vote of thanks to the President for his admirable address. A considerable amount of reconstruction work had been carried out at Dunfermline since Mr. Campbell asumed office; and this had required a great deal of thought and time.

Mr. JAMES BELL (Dumbarton), in seconding, remarked that he had been particularly struck with the excellent method the President had of recording where his main pipes were.

The PRESIDENT admitted that the reconstruction work had occupied much of his time and thought. Even so, he was bound to concede that, but for the loyal co-operation of the staff, both past and present, it could never have been carried out.

THE GOLF TROPHY.

The PRESIDENT thereafter announced that the competition for the Golf Trophy of the Association had taken place on the preceding day, and had resulted as follows: (1), and winner of challenge rose bowl, David Fulton, Helensburgh, 89—14 (75); (2) W. M. Cumming, Dunblane, 82—5 (77); (3) James Dickson, Dundee, 98—18 (80); (4) James R. Stevens, Elie, 85—4 (81); (5) a tie, Peter Sim, Buckie, 95—12 (83), George Keillor, jun., Dunfermline, 88—5 (83), and J. W. Scott, Manchester, 98—15 (83). The President said it gave him unbounded pleasure to ask their Secretary to accept the custody of the trophy for a year. At the last annual meeting, Mr. J. W. M'Lusky had ventured to hope that the bowl might go to the West on this occasion, since already it had been long enough in the East. Mr. Fulton had duly seen to the realization of this hope.

Mr. FULTON, in accepting the trophy, humorously remarked that it was the unexpected which always seemed to happen. Certainly his luck had been well in on the previous day. For instance, at the ninth hole he drove the ball clean out of the boundary; but it seemed to hit somebody or something, and came in again.

The PRESIDENT remarked that the Council were of opinion that the competition should be taken charge of formally by a duly-constituted Committee, who would be responsible for the arrangements and the conditions. He would move a resolution to this effect.

Mr. JOHN WILSON seconded the proposal; and it was unanimously agreed that Mr. George Keillor, of Greenock, as one of the oldest and best golfers in the Association, should be the Convener of the Committee, which would comprise Messrs. Rule, Philp, and Bell.

PAPERS AND DISCUSSIONS.

On resuming after the luncheon interval, the following papers were read and discussed:

"Present-Day Requirements in Gasholder Storage," by Mr. James J. Scott, of Cowdenbeath.

"Reducing Unaccounted-for Gas," by Mr. James Dickson, of Kirkintilloch.

Mr. Scott's paper, and the discussion, will be found on p. 610 of this issue; and Mr. Dickson's contribution, with the discussion, on p. 612.

NEW SOUVENIR FOR PRESIDENTS.

Mr. J. W. NAPIER (Alloa) explained that the Council of late had given consideration to a scheme whereby the Presidents in successive years would be presented, as a souvenir of office, with something different from a medal. This souvenir had now been prepared, and he hoped the members would approve of it. Perhaps it was unnecessary for him to remind those present that he had personally taken a special interest in the scheme for the erection of the William Murdoch Memorial at Lugar. That memorial, it would be recalled, was erected at the birthplace of Murdoch in July, 1913. The inception of the idea, which lay with the late Mr. Hislop, of Paisley, the late Mr. Myers, of Saltcoats, and himself (the speaker), arose out of a visit which they paid to Murdoch's birthplace in Ayrshire. Well did he recall that occasion, and particularly did he remember that striking personality in the gas industry, the late Dr. Thomas Newbigging, who made it his duty to come to Scotland for the event. That veteran of the industry was a gentleman of rare literary excellence and poetical ability, because there was still on his (Mr. Napier's) bookshelf a volume of poetry gifted by Dr. Newbigging to his father, when the latter was Secretary of the West of Scotland Association. Well did he recollect the veteran standing by the side of the River Lugar, and reciting, with delightful effect, this beautiful verse from Burns:

> "Behond yon hills, where Lugar flows,
> 'Mang moors and mosses mony, O,
> The wintry sun the day has closed,
> And I'll awa to Nannie, O."

It was fitting that the Association for the future were to have, as a souvenir for coming Presidents, a permanent memento of Murdoch; and the reproduction now before the meeting was a replica of the William Murdoch Memorial at Lugar. It had received the commendation of Mr. H. S. Ganley, of Edinburgh, perhaps one of the best and foremost Scottish artists of to-day. He (Mr. Napier) was glad to think that a Scottish Association should be the first to adopt such a souvenir for their Presidents. The first recipient of the replica would be Mr. J. W. M'Lusky, of Glasgow, the President of last year. In respect that he was the first recipient, Mr. M'Lusky was to be envied; but at the same time they were all delighted that the gas engineer of Glasgow should be the first to be so honoured. They recognized in Mr. M'Lusky a gentleman of great worth to the profession, by reason of his position and his abilities. He asked Mr. M'Lusky's acceptance of the replica.

Mr. J. W. M'LUSKY, in the course of his acknowledgment, said he could conceive of nothing more appropriate as a Presidential souvenir than a replica of the memorial at Lugar. It seemed to him that they did well to honour such a man as Murdoch, because when they thought of their own daily toil and experience, and took into account the help they received from others, they were bound to concede that theirs was a "walkover" compared with the lot of Murdoch. He felt honoured at being the first to receive the replica. He asked Mr. Campbell's acceptance of a similar replica, the gift being commemorative of his year of office which was now about to close. The meeting at Dunfermline, he added, had proved most successful; and in the selection of Mr. Campbell as President, the members had made no mistake.

The PRESIDENT feelingly replied.

NEW OFFICERS.

The PRESIDENT announced that the officers for the ensuing year were:

President.—Mr. John Wilson, Motherwell and Wishaw.

Vice-Presidents.—Mr. James Bell, Dumbarton (Senior); and Mr. Harry H. Gracie, Edinburgh (Junior).

Members of Council.—Messrs. James J. Scott, Cowdenbeath, and Henry G. Ritchie, Falkirk.

Mr. JOHN WILSON (Motherwell and Wishaw) said he much appreciated the honour that had been conferred upon him. It was a distinction to be President of such a live Association. He was particularly pleased that the honour had come his way at the present time, when his father was still in their midst, and in a position to enjoy the meetings and the proceedings.

VOTES OF THANKS.

On the call of Mr. JOHN FRAZER (Dalmarnock, Glasgow), votes of thanks were passed to the readers of papers and the scrutineers.

Mr. WILSON proposed a similar compliment to the President—a gentleman who had given admirable service during the year, and had conducted the meeting in a most able manner.

The PRESIDENT'S reply terminated the meeting.

RECEPTION.

On Thursday evening members and friends were the guests of the Provost, Magistrates, and Councillors of Dunfermline at a reception and dance in the magnificent Carnegie Trust Gymnasium, in Pilmour Street. With good music and a good floor, and the warm hospitality which characterized the whole of the proceedings, a thoroughly enjoyable evening was spent. The guests were received by the Provost and Mrs. Fraser, and the Convener of the Gas Committee and Mrs. Smith.

TAYMOUTH CASTLE.

A large party left Dunfermline Lower Station just before 10 a.m. on Friday, by special train, which for two hours travelled northwards through scenery that grew ever more beautiful. Loch Leven, Perth, Dunkeld ("Gateway of the Highlands"), and innumerable views of the erring Tay, turned the clock too fast; and we embarked on motor coaches at Aberfeldy, to find that the early approach of a wintry wind had capped the highest hills with snow. Five miles along the river bank brought us to the park and castle of Taymouth, where a delightful afternoon was to be spent.

Taymouth Castle is now an hotel; but the beauties of castle and policies have been preserved, and non-residents are made welcome. Luncheon was soon served—road arrivals had swelled the party to 155—and then Provost Haggart, of Aberfeldy, who is also Chairman of the Aberfeldy Gas Company, welcomed the visitors. Mr. Campbell briefly responded; and all went their respective ways until 4 p.m. On this arrangement we desire especially to congratulate the Council and Mr. David Fulton, for the trip that has to be organized to the last minute is bound to lose much thereby. At Taymouth, of course, circumstances were ideal for leaving the visitors to their own designs; for the bright day led some to the private links in the park, while some walked and others learned all about the castle. Tea was served before the departure at 4.15; and the return journey passed as pleasantly as the morning one. The excursion was a fitting close to Mr. Campbell's successful year of office.

It would be amiss not to include mention of the excellent programme arranged for the ladies. On Wednesday afternoon they visited the Abbey and Palace ruins, and took tea in the Pittencrieff Park and Gardens. On Thursday morning they were enabled to view the embroidery works of Messrs. Wilson

& Wightman and the linen works of Messrs. James Mathewson & Son, Ltd.; and in the afternoon they inspected the Carnegie Baths and Women's Institute, and heard something of the munificence of the man who, in his great fortune, remembered the town of his humble birth. Mrs. Campbell was a gracious hostess, and indefatigable throughout.

THE EXCURSION TO TAYMOUTH CASTLE.

[FROM A SCOTTISH CORRESPONDENT.]

Scottish Gas Managers selected Dunfermline as the place of meeting for 1925, and in doing so unconsciously paid a debt of remembrance to the traditions of ancient Scottish Kings and Queens. The city by the Forth was the birthplace and playground of Royalty for some centuries of time. To-day the Abbey of Dunfermline and the surrounding ruins are rich with the remains and emblems of troublous times of Church and State. This atmosphere of bygone ages was evidently not enough to satisfy, by way of change, the technical and commercial mentality of the members and visitors. The curtain rings down upon Dunfermline.

On Friday, the scene changed to Perthshire and to Breadalbane, where feud and warfare of the clans at one time raged, and where Scottish Kings loved to hunt the deer in the glens of those romantic parts. Taymouth Castle is the ancestral home of the Campbells, built by Sir Colin Campbell of the sixteenth century—erected by him on the spot as directed by the old woman, "where he should hear the first mavis sing in spring." The castle building is constructed of chlorite slate from a local quarry. It is a soft stone, but hardens with exposure. The castle has been converted into a palatial hotel, and the policies formed into a playground, having an 18-hole golf course, and extensive walks through woods with ancient beeches and by the bank of the River Tay. The surroundings are charming, and the scenery grand and poetic.

The visitors enjoyed the full freedom of the palatial public rooms of the castle, in which is invested the romance of the long line of Chiefs who occupied Taymouth—the grand staircase, with its niches filled with figures of armed knights; the Banner Hall and the Barons' room; the magnificent drawing-room, with its great beauty of ceiling, the work of Italian artists for seven years; the ballroom, with its carved fireplace; and the library gallery, with its wonderful carvings in wood. The management of the hotel gave the use of the Barons' room to the visitors for lunch. History and tradition here, again, looked down upon them from the great oil paintings of kings and men of valour.

At the lunch Provost Haggart (of Messrs. P. & J. Haggart, royal woollen manufacturers, Aberfeldy), in felicitous speech, bade the company welcome to Taymouth. He apologized for having, many years ago, tried to influence the extinction of gas by electric light in Aberfeldy. Time and knowledge had changed his views, and to-day he found himself the Chairman of the Gas Company. He hoped the Association would come again to Taymouth, where they would always find a Highland welcome. The President thanked the Provost for his kind words and for his faith in the gas industry. The new President (Mr. John Wilson) proposed a vote of thanks to Mr. and Mrs. Campbell for their labours in making the meeting a success—to Mrs. Campbell especially, on behalf of the ladies, for her attentive escort in their visits to places of interest at Dunfermline.

The visit was a perfect quiet delight to everyone, and will remain a pleasant memory to complete what will for long be fitly spoken of as the historical meeting of the Association at Dunfermline in 1925.

Distribution Systems and Earthquakes.

The earthquake which occurred at Santa Barbara on the morning of June 29 last (and the numerous shocks of much less intensity throughout the day and for several days following) caused no serious damage to the manufacturing plant of the Southern Counties Gas Company; but the distribution system naturally suffered in a great many places. Risk of serious fire was, however, obviated by the prompt shutting off of the main valve on the pipeline leading into the city. Describing, in the "American Gas Journal," the nature and extent of the damage done, Mr. Frank H. Bivens, the Company's General Agent, says that, in a preliminary way, their observations as to the effect of the earthquake on the distribution system can be stated as follows: Bell-and-spigot cast-iron pipe, properly laid with lead joints, is sufficiently flexible to stand an earthquake of very considerable intensity without breaking. Screwed steel or wrought-iron pipes show a serious tendency to pull apart and break in an earthquake. This break usually occurs in one of the few threads remaining outside the coupling after it is made up. Welded steel or wrought-iron lines will stand an earthquake of considerable intensity without pulling in two. Cast-iron fittings must not, however, be used in such welded lines. The greatest danger of leakage in an earthquake is at the point of connection between service pipes and mains, and at ells on the service risers. Every effort should be made to render these connections as strong and as flexible as possible.

PRESENT-DAY REQUIREMENTS OF GASHOLDER STORAGE.

By JAS. J. SCOTT, Engineer and Manager of the Cowdenbeath Gas Company, Ltd.

[A Paper read before the North British Association of Gas Managers.]

I raise this subject to-day because it offers an opportunity for discussion on a question of importance to every gas engineer, each of whom has his experience to draw from, to ascertain, if possible, what is a reasonable ratio of effective storage to maximum output, in the light of present-day manufacturing and distribution conditions.

To provide a basis on which progress can be measured, comparisons made, and conditions examined, it is usual and often useful to go back a few years. Doing so in this case we find that 24 hours of maximum output was considered perfectly sound as regards storage.

In a recent contribution to the "GAS JOURNAL," Mr. Norton H. Humphrys briefly outlines the conditions necessitating such a factor of storage "in these days when the bulk of the consumption came between dusk and 11 P.M., and troubles due to pitch, naphthalene, and frost were part of the regular winter experiences—to say nothing of fog and November afternoons—along with the use of carbonizing plant which lacked the flexibility of the present-day plant."

With these conditions as a basis, we are able to compare how far changes have taken place. The ever-increasing day load for cooking, trade, and industrial purposes has been effective in levelling-up considerably the operations of production, while the gradual increase in the use of electricity for lighting has slightly eased the night load. We cannot, however, overlook other increases of night load due to the development of the gas fire, fish ranges, &c.; while even the lighting load is maintaining itself, due to the later habits of consumers, caused by various forms of night entertainment such as the wireless and the cinema. Therefore the night load still holds a very strong position.

The flexibility of the modern gas-producing plant is referred to as an aid to storage, and I presume this applies mainly to vertical retorts and water gas plants.

Keeping in view the desire to supply a regular quality of gas, this flexibility on the part of the vertical retort must be limited, unless it refers to retorts under fire as stand-by. Is it not general practice to utilize this so-called flexibility very largely in everyday working, due to the incessant demands for efficiency, leaving the real flexibility to show itself in the form of additional retorts?

As a matter of fact, ample storage is essential with vertical retorts, for several very practical reasons—loss of heat, indifferent quality of coal, scurfing, &c.—affecting the production substantially, because of the relatively large units employed, the correction of which disturbances requires time.

Generally, water gas plants have been regarded as very desirable adjuncts to the gas-producing plant, towards meeting sudden loads, and in effect supplementing storage. I venture to say that within recent years this type of plant has moved from the reserve to the front line in the production of town gas, replacing retort power proportionately, and thus reducing its availability for replacing storage.

While pitch and other troubles may have eased considerably, modern plant and its auxiliary machinery brings with it added responsibilities for its constant working. November fogs are not yet peculiar to the past, and in addition we have to meet the sudden demands of exceptional day load caused by the occasional heat waves of a few days' duration, when domestic fires go out and every type of gas cooking appliance comes into use.

Nor can it be overlooked that to-day the requirements in gas supply are more onerous than ever. We must be able to conform to the requirements of the Gas Regulation Act as regards constant quality and pressure. Our gas is used for innumerable purposes other than lighting, our consumers demand that their needs be met, and we support our distribution and sales departments to this end by supplying regular quality and ample quantity under good pressure. I feel sure that satisfactory storage accommodation helps towards economy and efficiency in production, and service with satisfaction in distribution.

The most serious aspect of the provision of storage is the cost involved and the effect on the capital account. It is generally referred to as "dead" or "unproductive" capital; and invariably such expenditure is postponed as long as possible. But I submit that the provision of additional storage gives an opportunity for economies to be effected, directly and indirectly, the value of which should be credited to the proper quarter. Other benefits and advantages accrue in the general conduct of the works, the value of which, though fully appreciated, cannot easily be computed.

One other prospective advantage of a productive nature is that very regular quality gas can be obtained, due to the opportunity of increased mixing which additional storage provides.

My own experience—and I think it is general—is that the gas passing into a holder varies as much as 50 B.Th.U., and the outlet gas from 10 to 20 B.Th.U., the reduction being due entirely to the mixing effect obtained in the holder. If this latter gas was passed into a second holder prior to distribution, the further mixing would reduce the variation, thus providing a more constant quality, with a closer margin to the declared value. How many therms are lost per annum when the storage conditions render it necessary to work in excess of the declared value, to allow for variations and keep within the Act? An economy of 5 B.Th.U. per c.ft. in a 100 million works is worth 5000 therms at the selling price, which is a consideration. There is the instance of a London Gas Company finding that 5 B.Th.U. in excess of their declared value represented a loss of thousands of pounds per year.

Storage is invariably referred to in terms of cubic capacity, irrespective of the pressure available in relation to that required to ensure an adequate supply to the district. Properly, it should be graded as effective and ineffective, based on this circumstance. When 40 tenths pressure is necessary for district requirements, and only 28 to 30 tenths are available, the result is obvious, though the ineffective must not be entirely discredited, notwithstanding its disadvantage, as time and again many of us have been glad of its assistance.

Of course, the usual reservations are made for local conditions and peculiar circumstances, and the fact that the storage ratio varies inversely with the output. Many of us find ourselves with less than 24 hours' total storage, which is usually referred to as so many hours of maximum daily output; but I do not think this represents the true value of the storage.

My opinion is that it should be related to the number of hours of maximum load which it may be called upon to meet. For instance, 12 hours of maximum daily output may only equal 8 to 9 hours of maximum load period.

An actual case in point might be cited:

Total storage	150,000 c.ft.
Effective storage	100,000 ,,
Maximum daily output	400,000 ,,
9 hours' output between 3 p.m. and 12 p.m.	197,000 ,,
7 hours' output between 4 p.m. and 11 p.m.	165,000 ,,
6 hours' output between 4 p.m. and 10 p.m.	148,000 ,,

If the effective storage is considered, it will be seen to represent 4 hours' output.

While conditions have substantially changed compared with the old days, on balance the present-day conditions still warrant the 24 hours' factor of storage being retained as sound and proper.

From the Statistical Report furnished in this Association's Annual Report for the years 1904 and 1920, the earliest and the latest available, I have extracted some particulars to ascertain what the actual conditions were in these years, as affecting Scotland generally.

Year	1904.	1920.
No. of works in which storage was over 48 hours	9	7
Over 24 hours and under 48 hours	72	76
,, 18 ,, ,, ,, 24 ,,	47	42
,, 12 ,, ,, ,, 18 ,,	52	47
Under 12 hours	15	13

Notwithstanding that during these sixteen years the increase of gas output amounted to approximately 7600 million c.ft., or 50 p.ct., it is of interest to note the close similarity of the storage conditions, and also the large proportion over 18 hours' storage.

It would be interesting to know if the practice during the past five years has materially affected the storage factor compared with the two years referred to.

Discussion.

Mr. HARRY H. GRACIE (Edinburgh) thought the author was entitled to the thanks of the members of the Association for the interesting paper he had submitted. Mr. Scott still clung to the old idea of expressing himself in terms of thousands of cubic feet; but it might have been better if the author had put his conclusions and opinions on the basis of therms. The table of figures showing the storage capacity in works throughout Scotland during the years 1904 and 1920 was most interesting, and disclosed, to his mind, a state of affairs that was altogether gratifying. Indeed, the table of statistics seemed to indicate that, if changes had taken place in gas manufacture, they had not materially affected the question of storage.

Mr. J. W. M'LUSKY (Glasgow) said the experience of Glasgow covering twenty years was somewhat interesting. It showed that the city could develop the sale of gas for the period mentioned, and never go into the market for a holder. He wanted to explain how it was done. In 1904 the day and night consumption in winter was 44·9 and 55·1 p.ct. respectively, and twenty years later—that was to say, in 1924—the comparable figures were 54·6 and 45·4 respectively. In 1904 the average in summer was (by day of twelve hours) 37·7 p.ct. during the day, and 62·3 p.ct. for a similar period at night. Twenty years later the corresponding figures were 54·5 and 45·5. He regarded it as noteworthy that during the above period the sale of gas per annum had been increased from 5900 million c.ft. to 8700 millions. This was equal to 47 p.ct. The maximum day's output in winter had only moved from 37·1 million c.ft. to 38·6 millions—an increase of 4 p.ct. While the day load had considerably increased, this had taken place in summer, which had the effect of securing more service from the existing plant, and an increased sale of gas to meet overhead charges. If the experience of Glasgow to which he had referred applied nationally, then this was another reason why gas was being sold at from 30 to 60 p.ct. over pre-war rates, while coal and wages costs were 100 p.ct. more. Undoubtedly, the experience of Glasgow over the past twenty years proved that an effective storage capacity equal to the maximum 24 hours was ample. Any less than that amount would reduce the ability of the gas department to meet varying conditions. The writer of the paper had had experience of high-pressure distribution; and that being so, it was rather surprising he did not illustrate in his contribution how boosting would come to the aid of what he called ineffective storage. It did appear to him that the undesirable fall of 10-10th to 12-10th pressure could be easily avoided by a simple piece of boosting apparatus, either from the light holder to the heavy one (which would be provided with stoppers on the guides), or straight to the district. Glasgow's average calorific value since adopting the Gas Regulation Act equalled 476 B.Th.U., or 6 B.Th.U. more than the declared value. In the city of Glasgow, however, they did not consider this a loss any more than the grocer who gave 1 p.ct. extra of good weight. In the course of his paper, the author had referred to the recent contribution to the "GAS JOURNAL" from Mr. Norton H. Humphrys, on the question of fog and its effect on the factor of storage. On that point he had this to say—that in the city of Glasgow fog was gradually disappearing, largely, he believed, owing to the extended use of gas and electricity. Any fogs of recent winters experienced in Glasgow had contained a greatly reduced percentage of domestic smoke.

Mr. JOHN WILSON (Wishaw and Motherwell) remarked that, when those responsible for gas undertakings laid-down gasholders, they did not do so merely to suit the exact need of the day. They provided, generally speaking, something larger than was warranted by immediate requirements. He could not see how the provision of greater storage capacity impaired efficiency. In his own case at Motherwell and Wishaw, by installing a large holder they had increased the efficiency. His experience had gone to show that when they erected a holder of the larger type they could do with an oven or so less. When he took over the appointment at Motherwell, they were using four ovens. At present, however, they required to make use of not more than three; and this despite the fact that they had increased the output from 145 to 262 millions. Unquestionably, the larger holder had effected an economy in that direction.

Mr. GEORGE KEILLOR (Greenock) took the view that a holder storage capacity of 24 hours was just as necessary to-day as it was 30 or 50 years ago. It would be noticed that Mr. Scott referred to the flexibility of the modern gas-producing plant as an aid to storage, and he appeared to think that vertical retorts had more flexibility in the making of gas than horizontals. He (Mr. Keillor) had worked with both; and personally he did not approve of this view. Indeed, the only point in regard to practical working where one might say the verticals were better was in regard to quality. In Greenock they were able to work closely to their declared value, 410 B.Th.U. Last year the average was 411·3 B.Th.U. During last year in Greenock the maximum output between 6 a.m. and 6 p.m. was 1,215,000 c.ft., or 50·9 p.ct. of the total. In 1913-14, the proportion of midwinter output between 6 a.m. and 6 p.m., and 6 p.m. and 6 a.m., was 40·3 and 59·7 respectively. For the same year the midsummer maximum output represented 45·1 and 54·9 p.ct. respectively. He might add that in Greenock they had no occasion to make use of water gas. The maximum output for one hour—between 6 p.m. and 7 p.m.—was 147,000 c.ft., while the total storage was equivalent, approximately, to 16 maximum hours.

Mr. JAMES BELL (Dumbarton) said that at present their storage capacity represented 130 p.ct. of the maximum output. In other words, they had about 36 hours' supply. He thought a storage capacity of 24 hours was the lowest they could comfortably employ.

Mr. DAVID FULTON (Helensburgh) said that, when initial adequate storage was provided, it meant there would be uniform working of the plant in a gas undertaking. On the other hand, inadequate storage meant intermittent working of some portion of the plant; and this certainly conduced to reduced efficiency and increased expenditure. To his mind, the question of storage generally was one of local circumstances. To begin with, the author enunciated the theory that, because in the past few years many works had carried on with a storage very much less than the maximum daily output, it was no longer necessary to have a storage capacity of 24 hours. Later on in his paper, Mr. Scott set about to destroy such a suggestion. Personally, he (Mr. Fulton) thought they still required to regard a storage of 24 hours as the minimum, if they were to get the best out of the works.

Mr. SCOTT, in a brief reply, remarked that, from what had been said, it would be generally conceded that a storage capacity of 24 hours was still regarded as sound practice.

Sir John Cass Technical Institute.—The 1925-26 session of the Institute (which is situated in Jewry Street, Aldgate, E.C.) will commence on Monday, Sept. 21, and students will be enrolled on Sept. 16, 17, and 18 from 6 to 8.30 p.m. Instruction is given in gas manufacture, pure and applied mathematics, physics, chemistry, petroleum technology, and other subjects. The courses of instruction are held from 6 to 10 p.m. Full facilities are provided in the well-equipped laboratories of the Institute for special investigations and research. The instruction in experimental science also provides systematic courses for the examinations of London University, the City and Guilds of London Institute, and of the Institutes of Physics and Chemistry. Special courses of higher technological instruction form a distinctive feature of the work of the Institute; and during the coming session there will be included in the syllabus technical gas analysis, gas manufacture, fuel, refractories and furnaces, and applications of engineering.

REDUCING UNACCOUNTED-FOR GAS.

By JAMES DICKSON, of Kirkintilloch.

[A Paper read before the North British Association of Gas Managers.]

To choose a subject upon which to write is in itself a task. Every conceivable phase of our work seems to have been dealt with in the many able papers given to our own and other associations. In talking over the matter with the Secretary, however, I felt that, as time would not permit me to read a paper containing much detail, a general talk on some distribution points might form a suitable subject. I then decided to deal with the major causes of unaccounted-for gas in our distribution systems, with special reference to experiences gained in an endeavour to reduce these losses in my own sphere of labour.

UNACCOUNTED-FOR GAS.

The manufacturing side of our industry offers the greatest field for economy, and I would not wish to overlook it; but to be in any way neglectful of the distribution side is the very reverse of economy and efficiency. When we make gas, it is with the object of selling it; and what is not paid for by the consumer directly must necessarily become an indirect charge. It is, therefore, incumbent upon us to distribute gas in the most efficient manner possible. This is a subject in which I have interested myself for some time. I have often thought that, if works were to record their size, and base their comparisons on figures of gas sold, instead of gas made at the works, it would have the effect of revealing more truly the all-round efficiency of control. Gas unaccounted for varies in amount in works throughout the country from 2 to 30 p.ct., but generally I believe the average is about 8 to 10 p.ct. The causes of loss, which may be controlled, can be limited to mains, services, and meters. Other questions, such as condensation and the variations of pressure, may be considered outside our control. Beginning, therefore, with mains, the first medium for conveying gas from the works to the consumer, the chief sources of loss are leaking joints or fractured pipes caused by varying surface pressures or subsidence in the ground. In addition, these may be aggravated by the corroded condition of the pipes, due to the nature of the subsoil. In most cases, troubles like these may be taken as inevitable, but occasionally there are other causes, which, if avoided, would reduce our troubles to some extent. For instance, the laying of a water or other public service pipe in the immediate vicinity of a gas pipe, apart from the inconvenience of carrying-out repairs or making new connections, causes weakening of the subsoil when the depth of the other pipe is greater than the gas pipe. I experienced this a short time ago when a street excavation was made in the immediate vicinity of a 6-in. main. The excavation was deeper than our pipe, and the ground, in consolidating itself (assisted by heavy motor traffic), caused a slight side-slip in the track of our pipe, and fractured the main at a point where it had been bored for a 2-in. service. Such things are common now, and, with so many heavy road vehicles, matters like this have to be watched very carefully. It is sometimes the case that our own fitters contribute to our troubles by careless work in making joints and the manner in which they attend to the support of the pipe in the bed of the trench. However, new work generally gives little reason for complaint, defects arising principally from old and worn-out mains. Clay soil is a good preservative for cast iron, and the life of a pipe in such soil is almost indefinite; but ground which has been made up with all sorts of rubbish may have a very harmful action on the metal, and in course of time the pipe may be tight only on account of the attachment of encrusted material, which, if removed, would leave the pipe in a porous condition. Peat soil is also very harmful to cast iron, and pipes of comparatively recent date may be cut through with a knife very easily. This I have experienced on several occasions. It therefore becomes obvious that, if any choice exists in the site of ground for the laying of a pipe, due consideration should be given to the nature of the subsoil.

Having indicated the causes which give rise to complaint, what has now to be considered is how best to overcome, or at least reduce, these evils. If the life of a pipe was a definite quantity, some systematic renewal scheme would be helpful in maintaining plant in an efficient state; but with varying local circumstances, due to subsoil and other factors, a scheme like this becomes impossible.

Another great difficulty is the financial question, which at any ordinary time would give cause for serious enough consideration, but in these days becomes a question with many works of not how much should be spent, but what is the sum which can be afforded. There is, of course, always something that of necessity must be done at some time or other during the year in order to overcome troubles that arise. However, if an argument need be put forth for the spending of money in this direction, surely the present is an opportune time, when the output of gas is increasing throughout the country at so rapid a rate. Having experienced a share in these increases, I have undertaken the policy of cutting-out all old and small mains, and in this way have improved the general distribution system of our works. Some of the old pipes taken out must have been in use for upwards of 40 years, and their condition was such that replacement inevitably resulted in a reduction in the loss of gas. In anticipation of a continuance of the increasing demand for gas, I have decided not to lay down at any time a main pipe less than 4 in. in diameter. I have found that there are times when the sale of gas is restricted on account of an indifferent supply; and that when larger pipes are laid, the necessary volume of gas is available, and it becomes much easier to push the sale of gas. This, of course, means that the ratio of loss to the increased output becomes less, as the factor for the loss has either not been increased or only very slightly. When leakage is evident in any locality, occasions arise when it is difficult to locate the exact place of defect; the gas often finding its way through some unlikely avenue. To-day, with so many of our streets and roadways treated with tarmacadam or other substance, causing an effective sealing of the surface, escapes of gas may be diverted far from their seat of origin. I have experienced instances of this where gas got into an old sewer pipe and a field drain. In each case evidence of escape was traced over 100 yards from its actual source.

My latest experience, which happened last year, was rather unfortunate, as the event resulted in an explosion which led to damage to property and, in consequence, a claim against our Department. On this occasion, a new factor appeared which has since caused a good deal of further trouble in dealing with escapes. It arose from the introduction of the underground system of laying telephone cables through our main streets. The various roads leading to the centre of Kirkintilloch rise with a steep gradient; and from the summit of the hill the main street branches-off at right angles, with a slight rise for a short distance, and then runs comparatively level. Gas which may escape in the vicinity of this line has the tendency to find its way into the fireclay ducts; and these act as a conveyor carrying it to the highest point of the street. In connection with the explosion mentioned, the gas travelled a distance of about 300 yards to the highest point of our main street. At the same time, curiously enough, this gas was ignited in a manhole fully 100 yards from that in which the active explosion occurred. The gas became ignited by the blow-lamps of workmen from the telephone department. These lamps were in use for over an hour before the explosion occurred, and then a few light reports along the cable lines were followed by the violent shock of the explosion in the manhole, as described. The method of laying these cable lines is, first of all, to put down a fireclay four-way duct. The joints are supposed to be coated with bitumen, in order to make them tight, and there are manholes situated at various intervals, to allow of inspection and also the insertion of further new cables. Since the completion of this work, about two years ago, I have experienced on at least three occasions great difficulty in finding escapes of gas which otherwise were not manifest, except that the telephone inspector complained that it was impossible for his men to carry out repairs in the manhole. Of course, while this is a considerable evil, it also does good in that, when the escapes are found, there is so much saving in the loss of gas. Since our experience in this matter, we have insured ourselves against third party risk in connection with our outside work. This, I think, would be a wise policy to adopt in any town where the same conditions exist.

SERVICE PIPES.

Leakages in gas service pipes are sometimes a little more difficult to deal with. Often such escapes arise when it is the proprietor's job to put them right. Escapes may continue because the owner is not willing to effect the necessary repair, while the gas department may be ignorant of any defects. Generally, however, when known, these are dealt with in a similar manner to mains; but the ownership and responsibility for the condition of service pipes has of late become an acute question with progressive undertakings, because most services of (say) ten years of age and upwards are much too small to supply the ever-increasing quantities of gas demanded to-day, due to the installation of all kinds of gas-consuming appliances. The renewals, therefore, present an opportunity for effective repair; and here I think the policy advocated by Mr. Napier in his paper at our spring meeting should be the principle adopted by all undertakings—*i.e.*, that they should be responsible for all pipes from the gas-works to the consumer's meter, except, of course, when in the first instance these be laid down by the proprietor from the line of boundary at his own expense. For myself, I have for some time now carried out work on this policy. What I often found was that a tenement with eight or ten consumers would be supplied by a ¾-in. service, which, while it might give sufficient gas for light, was totally inadequate to supply the needs of gas fires; and in several cases where fires were installed, it became compulsory on our part either to enlarge the pipe or to remove the newly-installed fires. Within the past year, on account of the large number of fires fitted, many services to tenements have been replaced by larger pipes; and while it has cost considerable sums to do this, I believe the ultimate results will fully justify the expenditure. In view of this state of affairs, however, I have got my Town Council to move in this question, and regulations have been adopted

whereby any plumber engaged by builders of new properties or individual houses must not attempt to put down any pipe for the supply of gas within the private boundary until the size and quality have been specified by the Gas Department, and the pipe, when laid, must be inspected and passed as satisfactory by an official of the Department. By this means we hope to reduce the cost of service replacements, and ensure sufficient gas for all ordinary requirements. Once the supply has been installed under our supervision, we are more willing to undertake future repairs on a generous basis. For a tenement or dwelling running parallel with the street, we carry-out all repairs free of charge; but where a private house is situated some distance from the roadway, we limit our generosity to the extent of doing all the necessary labour free, but make a charge for material.

METERS.

The effect of meters on loss of gas largely depends upon the amount of attention directed to their oversight. A competent meter surveyor can do much to keep-down losses by watchfulness in combination with the knowledge he may gather concerning the appliances in use and their effect upon consumption. In addition, by making reference to his survey book, a comparison can be made with the corresponding period of the previous year. This acts as a good guide, for the consumptions in corresponding periods are astonishingly similar. The control of surveyors should be entirely under the supervision of the gas manager. This is not always the case, and when it is not, it is to the disadvantage of the undertaking. In some towns the meter readings and all matters pertaining to this branch are in the hands of a collector. To my mind, this is not as it should be. From the experience I have had, I consider that the collector or chamberlain should be responsible for accounts only, and that all matters giving rise to question regarding gas consumption should be settled by a representative of the gas-works. In the great majority of cases, the works are cognisant of the introduction of additional gas-consuming appliances, so that, being ever interested in the increase of output, they keep a watchful eye to see the effects on the amount of the gas bill. At the same time, they are better able to estimate consumption. While a good surveyor can do much, yet, unless he has the assistance of a competent meter mechanic to carry out tests and otherwise decide the state of any meter which may be questionable to him, his interest will be of less value.

In 1921 I commenced a branch for giving full attention to meters, including all repairs. As soon as I got this branch established, I carried out a large number of registration tests on meters brought in from the district, and from the number of meters found to be registering slow, I realized such attention had been neglected. I followed this up by a complete inspection of the meter surveying books; and wherever it was thought that the consumptions were low, having regard to circumstances, these meters were removed to the works for test. This scheme was highly successful. Most of the meters had to be changed, thus confirming our suspicions. An amusing feature of this work was that certain consumers rebelled against our interference with their meters, as they themselves had made no complaint. In such instances their reasons were evident when the next meter reading was taken. As an example of the amount of attention we now give to meters, during the past year we changed 389, and in the previous year 392. With the total number of consumers at 3469, this therefore represents a large proportion of the total number of meters in use. However, the principal advantage lies in the fact that no meter is put into use at any time without having passed through a test and being certified as correct, irrespective of the period it may have been in service. Now that the meters are carefully watched by the surveyors, who are made responsible for all questionable meters, we find no reason for believing that much gas is lost through defective registration. Following up this question for my own information, I had tabulated 100 tests of meters, these being taken from the books in ordinary rotation. Of that number, 39 were correct, 41 averaged 5·75 p.ct. fast, and 20 5·35 p.ct. slow, and the average for the whole number of tests showed 1·29 p.ct. fast.

There is another question to be considered, which is, I believe, more vital—the case of an overworked meter. From my experience, I am inclined to believe that meters, if worked within their capacity, are extremely reliable, but when asked to do more than normal service, after having been in use for some time, register against the Department. In addition, the question of overstrain and excessive wear must be noted. I have had meters from the district tested at their standard rated capacity, and proved correct; but when the amount of gas passed was increased, then the accuracy of registration was impaired, the error increasing in proportion to the increased work imposed upon them. In my search for further information regarding meters, I wondered what the effects were with meters which were only used intermittently, or had been idle for a protracted period. I found that registration is not affected on that account, at least against the Department; but, as a result of several tests, I found the error to be in the vicinity of 1 to 2 p.ct. against the consumer when the meter was registering within its capacity. Much more might be said on this subject; but these experiences may make others prove the case for themselves.

Public street lighting is a further field making for possible loss of gas; and, depending how these are controlled and the amount of such control the gas department may have in their working, street lamps may add much or little. The methods of arriving at the consumptions are varied; and while meters may be used in certain lamps to form a basis for working-out an average consumption, it is often the case that they are entirely dispensed with. In my opinion, justice can be done and service best rendered to the public when street lighting is under the control of the gas undertaking.

CONCLUSION.

I have dealt with the principal causes of unaccounted-for gas, and in some little degree have tried to show whereby these might be reduced, though it cannot be claimed that there is much likelihood of effecting a complete remedy. Having done our best in looking after the distribution plant, we might ask the question whether or not that plant could do more work, so that by increasing the delivery of gas our inevitable losses might be reduced in proportion to the output. It would be reasonable to expect that if 20 miles of mains and services were required for the distribution of 100 million c.ft. of gas, and the quantity of gas increased by 100 p.ct., unaccounted-for gas would be reduced by about 50 p.ct. We have therefore to find out the best means for attaining this end. I am trying to push the sale of appliances on the most accommodating terms to the consumer, and this particularly among prepayment consumers, who, with us, at the time of meter collection, recover the high discount of 1s. 8d. per 1000 c.ft. of gas sold. The reason this is so high is that during the war, like other undertakings, we had to put up the price of gas, and the only guarantee of obtaining the increase in price from this class of consumer was to reduce the quantity per penny by altering all the change wheels. With the return to more favourable conditions, with a consequent drop in price, the reductions were applied as an increased discount from time to time. Among prepayment consumers we have been able to get a share of this directed toward the hire purchase of gas-consuming appliances. All rents for sales are obtained from the discount in the meter. Where the consumption is high, there are occasions when two quarters are paid instead of one, and the period of repayment is consequently reduced. The experience of this has led consumers to apply their discounts in other directions; and we find now that a number of pendants, gas irons, baking plates, &c., are being purchased in this way. Indeed, occasionally we even fit-up old houses with gas on these terms. Apart from fittings and small appliances, the number of gas fires taken up by this method during last year was 206, while ordinary consumers, who pay by the quarter with their gas bill, were responsible for the purchase of 83 fires on the same system. Of course, these figures are exclusive of other sales made on ordinary cash terms, and the issue of cooking appliances—such as rings, range plates, and cookers—supplied free.

I attribute to the aid of this scheme, combined with the greater attention paid to mains, services, and meters, the fact that I have been able to bring down our unaccounted-for gas from 8 to 4·2 p.ct. during the past three or four years.

I have sought to put before you a little of my own experience in distribution matters; and in doing so I do not lay claim to any special achievement. If my remarks have helped to arouse more interest in this side of our business, then the object of my paper has been fulfilled.

Discussion.

Mr. HARRY H. GRACIE (Edinburgh) thought the author was to be commended on the success which had attended his policy of relinquishing old and small mains. In Edinburgh the men who were sent out to the districts were first thoroughly trained in the workshops, so that they would be in a position to give consumers much helpful advice regarding meters, fittings, and appliances. In testing for escapes, he had often found it advantageous to drive a bore along the line of the pipe. This bore was driven to the point where they found there was the greatest accumulation of gas. It enabled the workmen to get as near as possible to the source of the trouble. In Edinburgh they had experienced similar trouble in regard to the operations of the Telephone Company. As a matter of fact, they had a somewhat serious explosion two months ago. It was caused by the fact that the Telephone Company had undermined one of the Corporation's mains. An understanding, happily, had now been reached with the Telephone Company that, where mains were underlying any cables proposed to be laid-down, the former would be raised. He was interested in what the author had said regarding insurance; and it would be of benefit if they could have details as to the premiums paid. The results of the various tests were no doubt interesting; but in order to get a real comparison, it seemed to him that one would require to know the amount of gas passing through the different meters.

Mr. E. EDISON STONES (Assistant General Manager of the Glasgow Corporation Gas Department) said that success in the direction of keeping down waste depended upon a careful watching of innumerable small matters. The author had said that they could ignore condensation and differences in pressure as being points over which they had little control; but he (Mr. Stones) ventured to say that these were probably the largest factors involved. Leakage from mains was relatively small. A far larger quantity of gas was lost through faulty service pipes and bad connections to mains. The case men-

tioned by the author where a 2-in. tapping had been made in the side of a 6-in. pipe was typical of much thoughtless work done on the district; but even this kind of fracture would not result in a large leakage, as its presence would be quickly perceived. Those responsible for the laying of mains and services had splendid opportunities for covering up bad work; and the persons responsible could not be traced accurately when trouble occurred. Cases often arose where services were laid in troughs; afterwards being pitched. If closely examined, bare spots would be discovered, which discounted the value of the whole job. He knew of no section of a gas department where money could be more easily wasted by burying inefficient work than in the mains and services section. He wondered how many of the members present knew definitely, from personal examination, that their employees were leaving sound work behind them. Meters were also a source of much trouble at present; and in Glasgow they were exchanging them at the rate of one thousand per week. An analysis of the reasons for exchange showed that escapes at the stuffing boxes constituted the chief source of trouble. Meter makers were aware of this; and it seemed to him they should provide a remedy. In connection with the statistics of all undertakings, gas used for public lighting was the controlling factor. Errors in computation could easily swing the result several points on either side of normal. It was a very difficult computation to make, particularly when the public lighting was not in the hands of the gas department. All public lamps were supposed to be governed; but without special examination no inspector could say if a governor was more than a hollow shell with the working parts removed. These factors all went to swell the difference between gas made and gas accounted-for; and he did not place too much credence in any of the statistics published. If the difference in Glasgow between these two figures represented an actual escape of gas in the atmosphere, then the city would be uninhabitable. The same argument held good with smaller undertakings.

Mr. DAVID FULTON (Helensburgh) said the author had told them in a simple way and in simple language how he had been able to reduce the percentage of unaccounted-for gas in Kirkintilloch. Arising out of the paper, a great deal had been said by Mr. Stones, of Glasgow, relative to the human factor, and the need for supervision. On that point he was going to defend country managers. The majority regularly superintended the laying of mains and service pipes. Speaking for himself, he could say that he saw every service that was laid. In his view, every main ought to be tested under pressure before gas for public consumption was turned into it. There was, of course, difficulty in getting workmen to follow-out explicitly the instructions given to them.

The PRESIDENT remarked that telephone cables had caused a certain amount of trouble throughout the country. The author referred to a case where a leakage occurred 300 yards away; but he (the speaker) had experience of a leakage some five miles away. An escape travelled all the way to the Inverkeithing Gas Company's mains; and at a distance of five miles the defect showed itself.

Mr. DICKSON, replying to the points raised in the discussion, remarked that the opinion had been ventured by Mr. Gracie that the deficiencies had already been met in the price of gas sold. Personally he feared they could not regard that sort of thing as a standing charge in all undertakings. Reference had also been made by Mr. Gracie to a method of looking for escapes. That method, he might say, had been tried in Kirkintilloch. Indeed they had spent days on one job recently, spiking the ground in the way Mr. Gracie suggested, but had been unable to get any light at all. Later on, they came upon the escape accidentally in a house which was being visited. A point had been raised with regard to third-party insurance. In Kirkintilloch the local Town Council had been faced with one or two claims; and they thought it prudent to insure. The insurance premium was based on the wages paid by the Corporation to outside workers, and amounted to about £30 a year. A suggestion had been made by Mr. Stones that possibly the street lighting might have been responsible for the unaccounted-for gas. He would remind Mr. Stones that the unaccounted-for gas in Kirkintilloch had been reduced by over 3 million c.ft., while the street lighting account was not equal to that. In Kirkintilloch, therefore, street lighting did not account for the difference. Mr. Stones had mentioned the advisability of adopting the principle of duplicate mains. He regarded that as a good idea; and a commencement along these lines had been made this year.

A vote of thanks was passed to the author for his paper.

UTILITY OF GAS IN MODERN BUILDINGS.

By W. M. MASON, Manager of the British Commercial Gas Association.

[Lecture delivered to the Building and Allied Traders at Birmingham.]

POINTS OF VIEW.—TRADITION.

The national housing problem is of necessity considered from many points of view. If we are numbered among the million or thereabouts who are said to be homeless, or living in insanitary houses, we may very likely have rather bitter feelings about the situation. If we have any real interest in the welfare of our fellows, surely we cannot be indifferent to housing problems from a social standpoint. If we are landlords, or property owners, holding unprofitable and depreciating investments, the situation is equally serious, and practical propositions for improvement should be welcome; while if we are fortunate enough to be engaged in that Eldorado of British industry, the building trade (which has only the gas industry as a serious rival in prosperity), we may still, as a further avenue to economy on the one hand, and increased prosperity on the other, be glad to hear of propositions whereby building costs may be substantially reduced and, at the same time, the buildings themselves made more serviceable to the occupiers.

It may be taken as a truism that, as a general rule, success in business means the tapping of a large public demand by supplying a satisfactory article, or proposition, at reasonable cost. The housing problem is big enough in all conscience; and it seems extraordinary that the following practical propositions should still have to be publicly advocated.

One would have thought that, years ago, personal interest would have resulted in the speedy adoption of methods that had been proved satisfactory, especially where economies and practical convenience had been repeatedly demonstrated. The breaking-away from old traditions is, however, never easy in this country in any sphere of activity, and certainly it is very difficult in the architectural and building world. This is why we are still emulating the voice crying in the wilderness, with more or less educational effect. We may, of course, comfort our souls by reflecting that this is the way of nearly all social reformers.

TWO GROUPS.

Housing problems, I venture to suggest, may generally be divided into two main groups. I am not proposing to attempt to discuss political and municipal housing questions. Life would be all too short for that task. What I do wish to do, however, is to rouse interest in a few specific points that should appeal to practical men and women.

The two main problems referred to are:

1. The converting of old or existing property to modern requirements.
2. Erecting new buildings.

Both these sections hold, of course, profitable business for the building and allied trades.

It will also soon be apparent that gas service can be of practical and substantial value—that, indeed, it will be indispensable to the satisfactory solution of many of the confronting difficulties. This may sound like a bold and dogmatic statement, but it is nevertheless a simple fact, the absolute truth of which is easily demonstrated.

OLD PROPERTY.

Consider the first of our main sections—the successful adaption of old property to modern needs. In London to-day—and doubtless in every important provincial city as well—thousands of large old-fashioned houses which had apparently fallen on evil days because of the city's growth or change of fashion are being converted into flats or offices, and so helping to meet the house famine, while, at the same time, changing a serious situation on the property owners' part into a sound and even profitable investment.

Take instances in the author's direct experience. The offices of our central Association, along with those of our kindred organizations, are at the present time situated in what were quite recently large six-storey London mansions, which have been converted into suites of offices. Whole streets have been, or are being, dealt with in a similar manner. We do not suggest that such offices are ideal—far from it. But the practice from a business and property owner's point of view is undoubtedly sound; and it certainly brings grist to the builders' mill.

The clean, easily adaptable gas fire plays an important part in these conversions; as cleanliness, ease of control, and the elimination, to a great extent, of outside labour are made possible.

HEATING BUILDINGS.

The use of town gas for heating large buildings is also becoming much more general, not only by gas fires fitted into existing grates or in tiled surrounds in the usual way, but as a means of heating a central boiler and supplying hot water to pipes and radiators. The objection that gas is more costly than cheap slacks or soft coal is countered by pointing to the saving of space effected by this means; and, when rental values in large cities are borne in mind, this is an important consideration. Gas installation has now attained to such a pitch of automatic perfection that the services of a resident engineer are unnecessary.

Another striking case of profitable conversion is to be found in what is now a large, fashionable, and popular hotel, almost opposite our offices. It occupies the front of practically a whole block, and consists of a series of shops and dwelling houses linked together, with large public rooms on the ground floor. Incidentally, the bedrooms are fitted with gas fires and automatic meters, so that visitors may have comfort and warmth at a moment's notice, without fuss or trouble, and at considerably less cost than by the old method. The saving in labour, as well as the added comfort of the visitors, is remarkable. This system is becoming popular in hotels and boarding houses throughout the country, as it helps to lengthen the seasons. Guests, before booking rooms, now frequently ask if gas fires are available; and many hotel proprietors state

in their advertisements that their establishments are thus equipped.

Business Flats.

Conversions into modern flats of large old-fashioned houses, the occupation of which the servant problem has made, in many instances, practically impossible, is a similar method that is becoming extremely popular, simply because it is profitable. Here again, gas service for household needs makes outside domestic help almost unnecessary. Modern business girls or business households are thus largely independent, in a way undreamed of in the old days. They dine out when they wish—for the modern restaurant and popular hotel cater more and more for this class of customer—and they come home when they please, knowing that comfort awaits them by the turning of a tap and the lighting of a match. This is no fancy dream or fairy tale—it is the daily or nightly experience of multitudes in our large cities.

The old-fashioned may, perhaps, be inclined to agree with the cynic who describes home as "the best and sweetest of places—at 1 a.m., when we're tired and every other place is closed"—but there you are.

The practice and possibilities of this development must surely

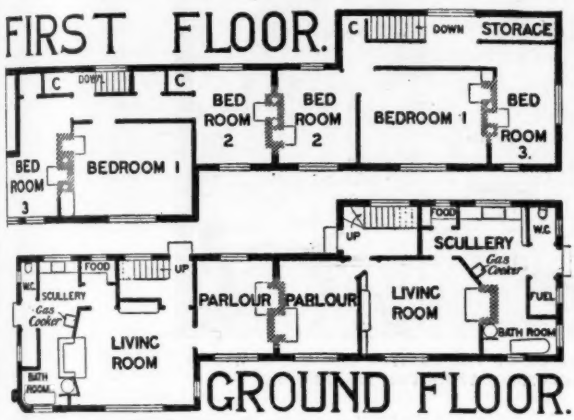


FIG. 1.—HOUSING PLAN SHOWING ALL COAL FIRE FLUES.

be of interest to the architect and builder, for they are the people who make the new order of things possible—helped, of course, by indispensable gas service.

The Second Group.

The second, and more important, side of our subject refers to new property. In every building, of whatever character, the question of heating is one of the first things to be decided. The architect cannot complete his plans or his design until this matter is settled. In the usual types of dwelling houses, blocks of offices or flats and hotels, where gas fires are used instead of the old-fashioned open fireplace, a considerable saving can be effected in building costs by the omission of chimney breasts and chimney stacks. Special flues can be built into the walls to carry-off the products of combustion from these gas stoves. Mr. Edwin J. Sadgrove, when President of the Society of Architects in 1919, made the following public statement concerning this new system:

> "I am prepared to plump with my colleagues, Mr. Swain, the Architect to Messrs. Rowntree, of York, and Mr. John Murray, Architect to His Majesty's Office of Woods and Forests, and with other architects who have given the matter careful consideration, for the abolition of the chimney stack in respect of every room in the house, with the exception of the living room."

The "Economy" Flue.

The system of installing what is now commonly known as the "Economy" gas flue, briefly described, means that, instead of providing a 9-in. by 9-in. coal-fire flue in each room, a ventilating flue of adequate size satisfactorily to carry away the products of combustion from the gas fire is provided by means of a small flue which can be accommodated in the thickness of the wall. This obviates the necessity for the unsightly chimney breast, the concrete hearth, and the trimmers, and provides a straight wall, with no corners and dust traps which are expensive to build and extravagant in labour to keep clean.

Liverpool has given an excellent lead by installing 21,000 "built-in" gas fires with "Economy" flues; the living room being heated by a specially-constructed coke grate, which also provides the domestic hot water supply. The flues in this case are contained in the wall, and are constructed by leaving out a 4½-in. brick. The shaft thus obtained is carried straight up through the roof, and terminates with a small chimney stack.

It has been estimated by architects of wide repute that the saving in building construction per room fitted with a "built-in" gas fire and "Economy" gas flue, as compared with a coal fire and ordinary 9-in. by 9-in. coal-fire flue, is approximately £10; and if we, for the sake of forming a very conservative estimate, discount this saving by half, it will be seen that in Liverpool alone there has been a saving of at least £105,000 in building construction by carrying-out this obvious improvement. At the same time, if the valuable additional floor space which is made available in the room were capitalized, it would represent a very large additional saving. To show what a modest estimate we have just given, the following extract from a letter recently received by us is of interest:

> "As a housing expert . . . my research has led me to the certain value and benefit to be derived by building houses for gas fire arrangements; and I have before me plans, with specifications, quantities, and known values, for (say) 13 type subsidy houses which show a definite saving in cost of designing for gas fires, as against coal fires, of £25 per house."

The introduction of gaseous fuel also plays a big part in tackling the question of smoke abatement on practical lines; and when we consider that, in the modern estates of Liverpool alone, we have eliminated the smoke nuisance from 21,000 chimneys, the saving will be beyond price from the view of public health.

By building a gas-fire flue of adequate size in the thickness of the wall, and with no chimney breast projection, the following advantages result:

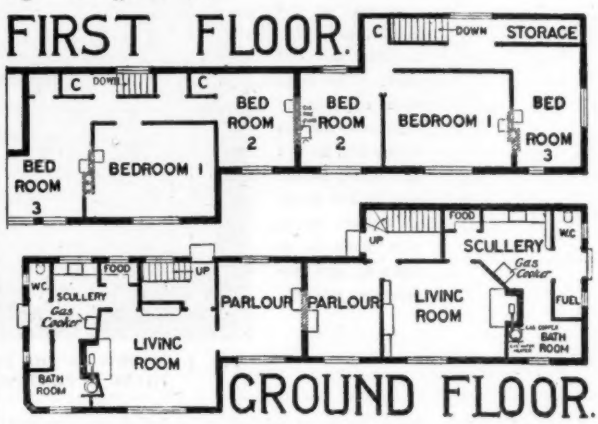


FIG. 2.—HOUSING PLAN SHOWING GAS FIRE FLUES EXCEPT FOR LIVING ROOM.

1. A reduction in the cost of building the house.
2. Greater floor space per room on the same ground area.
3. Greater cubic capacity of the room, thus providing more air, or breathing space.
4. The gas fire would look more artistic and would be decoratively part of the room, instead of looking like an afterthought.
5. There would not be two appliances fixed to serve the same purpose.

Gas Fire Mantels.

Special fittings are now constructed which combine a gas fire with a mantel register; and builders throughout the country

FIG. 3.—A "BUILT-IN" GAS FIRE WITH "ECONOMY" FLUE AND NO CHIMNEY BREASTS.

Note the economy in space.

The heating and ventilating plant of this cinema is so designed that any desired temperature may be obtained to ensure comfort, either by warming in the winter or cooling in the summer. The whole heating and ventilating system is put into operation by turning on and lighting the gas in the tubular gas boiler, and starting the pumps and fans. The engineer requires no additional man to assist him to run the plant, as the gas boiler needs no further attention once it is lighted, and involves no stoking.

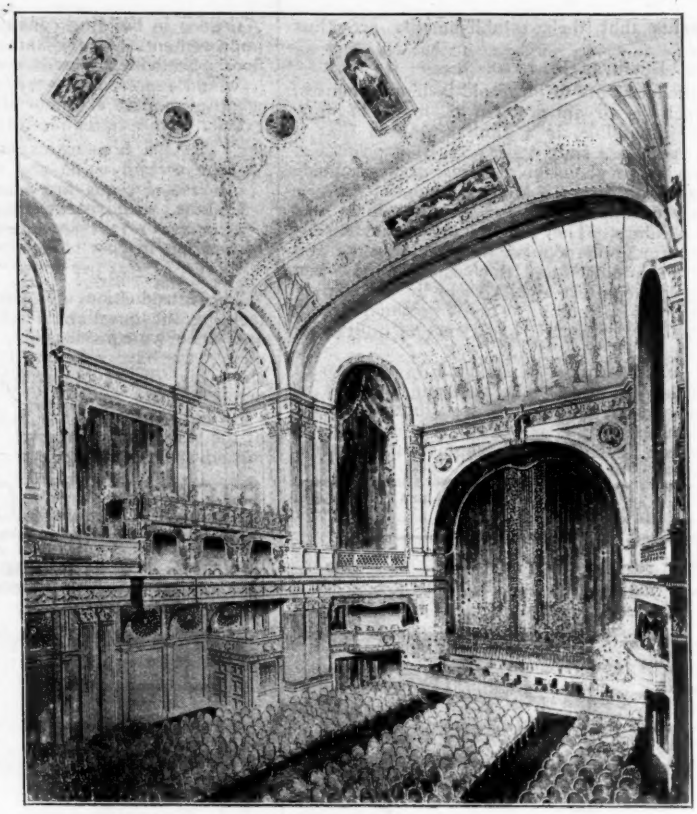


FIG. 4.—A VIEW OF THE INTERIOR OF THE CAPITOL CINEMA, IN WHICH THERE IS SEATING ACCOMMODATION FOR 2000 PEOPLE.

are showing their appreciation of this effective building economy by installing these gas fire mantel registers in conjunction with "Economy" gas flues. That this development is becoming increasingly popular as it becomes better known is proved by the fact that one firm of manufacturers have informed us that they have supplied over 1000 gas fire mantel registers to each of the Edinburgh and Glasgow Corporations for their housing schemes, in addition to over 2000 to the London County Council for installation in London. The gas equipment of these housing schemes also includes the "Universal" gas cooker, and in many cases a gas wash copper and gas water heater—making the houses ideal from the point of view of labour saving, and at the same time providing an efficient service that is within the means of their intended occupants.

Palatial Flats.

The service that gas can render in modern buildings is not confined to any particular class, but is applicable to the whole field of building operations. We have been considering houses for tenants of moderate means. Let us now turn to the other extreme. You have doubtless read of the demolition of that historical home known as "Devonshire House" (in Piccadilly) to make room for the erection of three large blocks of buildings comprising high-class shops and palatial flats.

The first block of buildings nearing completion is to be known as "Devonshire Court," and will accommodate 22 shops, a large restaurant, and 61 flats. The gas installation in this building is both comprehensive and complete, and will include the restaurant equipment, 61 gas cooking stoves, and about 200 gas fires, all ventilating into "Economy" gas flues. This surely demonstrates our claim that present-day gas service is universal in its application to modern buildings. It is, indeed, essential in the new homes of all classes.

What is true in the home is also true in other building operations. Take, for example, the latest London West-End Theatre and Club known as the "Capitol," recently built in Haymarket. This, the finest and most luxurious cinematograph theatre in Europe, is capable of seating 2000 people. The building also houses the exclusive "Kit-Cat Club," with its magnificent ballroom and restaurant. The whole of this building is heated by gas; and to save valuable floor space and free the basement for the ballroom, it was decided to house the gas-fired boilers on the roof. The installation comprises two gas-fired tubular boilers with a total capacity for delivering 2,000,000 B.Th.U. per hour into the building. The system has proved so satisfactory that, since the building was completed, only a few months ago, the gas installation has been greatly increased, and is utilized in largely providing for the cooking duty in the restaurant, and also for the domestic hot water supply.

The successful application of gaseous fuel at the Capitol has opened up wide fields for gas for the central heating of modern buildings.

One of the best-known drapery establishments in the West-End of London has decided to instal gas-fired boilers for warming the air to its new buildings. This is effected through the ventilating system. This installation will represent a much larger load than the Capitol Theatre, to which we have just referred. It will comprise three gas-fired tubular boilers fitted in the roof. Each boiler will be connected with a calorifier capable of delivering 3 million B.Th.U. per hour; but it is intended to run only two of the boilers constantly, retaining the third as a permanent stand-by. The total working capacity is 6 million B.Th.U. per hour, which represents a gas consumption of approximately 15,000 c.ft. per hour when full on.

Those responsible for the erection of large modern buildings will quickly appreciate the advantage of placing the boilers on the roof, as under these conditions the ventilation is obtained by induced draught, and the expensive chimney shaft is entirely eliminated. At the same time, the introduction of gaseous fuel frees valuable floor space which, in the case of solid fuel, would have to be occupied for the storage of fuel and ash, and, in the case of oil, for the storage tanks.

The introduction of gaseous fuel for this duty is undoubtedly one of the greatest advances made in providing the central heating which, while greatly reducing building costs, provides an automatic service without labour. It opens up a wide field for co-operation between those responsible for the erection of our large buildings and those providing the gas service; and we are confidently looking forward to a wide application of gaseous fuel for this duty.

Here again we not only reduce labour and building costs, but assist in reducing the smoke nuisance by introducing an ideal and economical smokeless fuel.

The Spirit of Service.

The gas industry, in its co-operative national schemes, as well as in the spirit of service which now permeates its activities, is endeavouring more and more to widen the basis and scope of its work. It recognizes, of course, that, by serving the public, it is best serving itself; but it is happy in that its work runs parallel with public welfare, and that, in pursuing its own business, it is at the same time, as an important public utility, fulfilling a programme of great value in national and communal affairs.

Making some inquiries in Birmingham, I asked, "What attitude do the Birmingham Gas Department adopt towards the builder of new property within their area, and towards the prospective tenant of that property?"

The general policy of service to which I have just referred has been carried out by the Department, and translated into local terms to suit local conditions. Inspectors are employed

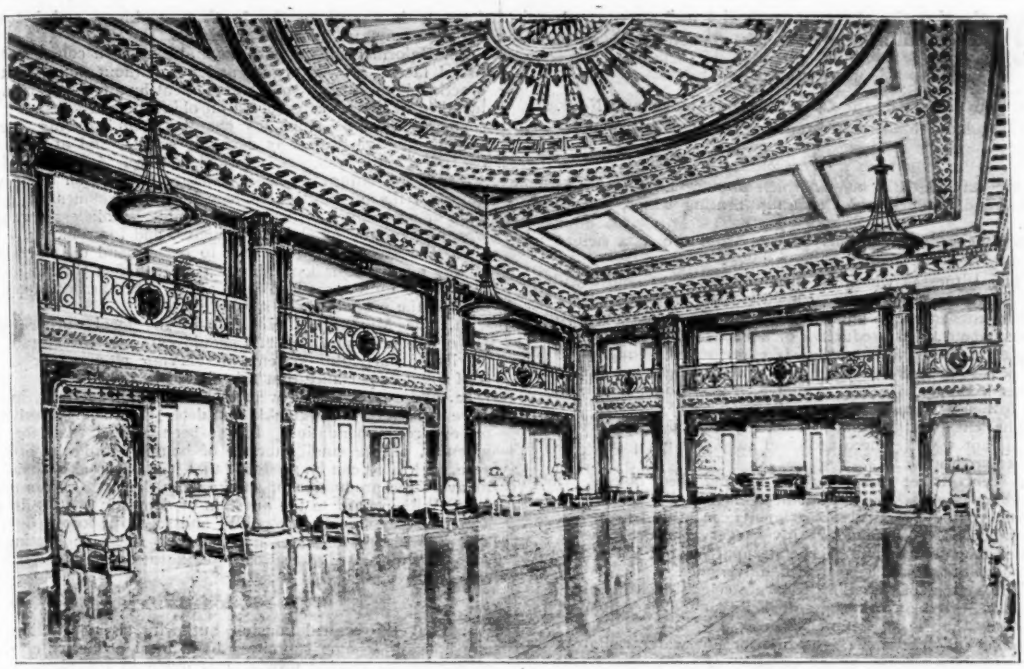


FIG 5.—THE MAGNIFICENT RESTAURANT AND BALL-ROOM SITUATED ON THE GROUND FLOOR BELOW THE CAPITOL CINEMA.

This room is heated on the Plenum system, and the necessary heat is imparted to the air by a gas-fired tubular boiler installed in a small boiler-house on the roof of the theatre.

whose duty it is to assist and advise consumers on any matters relating to the utilization of gas. As a part of this general policy of helpful service, I understand that an advisory section has been formed, the special function of which is to assist and co-operate with builders and architects. So varied are the uses to which gas is now put that suggestions regarding carcassing and pipe sizes generally are best given by those who have had long experience of this one particular subject. The Gas Department have no legal powers to enforce the size of pipes, &c., but act only in an advisory capacity. The Department realize, however, that if the architect's client is to be permanently satisfied and if good service is to be afforded him when he becomes a consumer, it is essential, in the first place, that gas supply pipes in premises should be of the correct size, and should be properly laid. To ensure this, the Department make a very reasonable offer to the builder—*i.e.*, they lay a certain length of private service from main to meter free in those cases where the house is fitted up to a specification which they have found to be adequate. This enables the builder to make a good job of the carcassing, without adding to his costs. The scheme shows that as much can be done by co-operation as by legal enactments.

Appliances.

Touching on actual gas appliances, both cookers and fires are let out on simple hire terms by the Department, while a very large range of high-grade up-to-date cookers and fires may be inspected at the various showrooms, and purchased on hire-purchase terms extending over three years, during which time the Department maintain the apparatus without charge. No charge is made for fixing, so long as an adequate supply pipe is left near the proposed position when the house is carcassed.

Trouble has been experienced in Birmingham, as elsewhere, due to the use of cheap and shoddy wash boilers. The Department have therefore adopted an excellent working arrangement with Birmingham builders whereby they provide and fix a thoroughly reliable cast-iron wash boiler, and run a suitable vent pipe to take away steam and combustion products, for an inclusive charge of £4, so long as an adequate gas supply is left near where the wash boiler is to be fixed. This ensures the provision of a good article, well fixed and ventilated, which will last many years, instead of wearing-out or giving trouble after a comparatively short period.

The builders in Birmingham have also the privilege of securing, at a very low price, the built-in gas grate, combining mantel, fire, and hearth in one unit, to which I referred earlier, and which is ideal as a means of providing heat with ventilation in the bedroom. If the builder is willing to fit this in a workmanlike manner, in accordance with the specification of the Department, the latter are willing to adjust the fire free of charge, and put fuel in the grate, when the house is completed.

Consumers in Birmingham have the choice of quarterly accounts and shilling or penny prepayment meters. There are now over 200,000 gas consumers in Birmingham, and the Department endeavour to meet their wishes, and also to assist those new consumers who are daily being added.

Builders and architects may rest assured that the Birmingham Gas Department will adopt a helpful attitude. The ultimate aim in every case is to see that apparatus supplied is such as has the maximum useful life, and that it is fixed in such a way as to give permanent satisfaction in use.

Smoke Pollution.

And now I trust you will suffer one brief word on a subject of vital importance to us all. Whether or not we are interested in building material things, we are all most assuredly helping to build public opinion—good or bad. One of the most crying needs of modern communal life is surely the prevention of air pollution by smoke. Practice is as necessary as preaching. What are we doing individually to bring more sunshine into our cities? All success to the propaganda for more natural sunlight. The pity is that, while the arguments are all in favour of sunlight, the practice of so many, even among the advocates of it, still makes so largely for continuation of the filthy air conditions which all too effectively obstruct it, or filter those rays which are so beneficial to public health.

The astonishing inconsistency of some people who, on the one hand admit and advocate the value of sunlight, and, on the other, still talk about the "romance" and delights of the open coal fire, would be amusing if it were not so pathetic. The burning of raw coal in the domestic grate has been proved to be the greatest source of air pollution—and this in spite of the fact that smokeless solid fuel in the form of coke, and gaseous fuel are available. As a rule, taking the whole household budget into account, these modern substitutes are more economical, besides being incomparably cleaner and more hygienic. As the most practical solution of the smoke menace and its allied evils, the part which gas plays in the homes of the nation is the most significant feature of modern development. With such substitutes for raw coal available, it is a crying scandal that the continued burning of raw coal should be allowed, with the accompanying pollution of the air we breathe, and, incidentally, the destruction of the invaluable products—sulphate, tar, dyes, and drugs—stored in the coal.

Surely the proper place for handling coal is the sunshine factory commonly known as the gas-works, where the valuable products are retained, and where clean, adaptable, and economical smokeless fuel is produced. In the past twenty years, in spite of strenuous competition, the output of gas by the Metropolitan and Suburban Companies has increased by 60 p.ct.—from 43,000 to 69,000 million c.ft.—and the gas appliances in use in their districts, so far as can be ascertained, have increased from 745,000 to 2,275,000—or more than 200 p.ct. During that period the hours of sunshine registered increased by 30 p.ct., and the death rate fell from 16·4 to 12·1 per 1000.

With such facts on record, in addition to the many practical building points we have been considering, it must be clear that,

on the grounds of national economy, social and communal welfare, and public health, the case for gaseous fuel is incontrovertible.

APPENDIX.

Extracts from Report of the Committee on Smoke and Noxious Vapours Abatement to the Minister of Health.

VI.—CONCLUSIONS.

55. We are satisfied that means which produce little or no smoke are available and practicable for cooking, heating water, and warming rooms.

56. Certain general conclusions emerge from the data before us, which we may usefully summarize as follows:

(1) The witnesses whom we have heard have almost without exception condemned either explicitly or implicitly the old-fashioned kitchen range and back boiler as inefficient, wasteful of fuel and labour, and productive of smoke.

Subject to the opinion previously expressed with regard to the future possibilities of electricity as a heating agent, we think that wherever a supply of gas is available, a gas cooker should be installed in lieu of a coal range.

(2) The cheapest and most efficient method of providing a supply of hot water, where a central supply is not practicable, is by a coke-fired boiler.

(3) A central hot water supply for detached houses, where practicable, is a desirable system, if it can be provided at a moderate cost. Practical experiments in this direction are urgently needed, and should be given every encouragement.

(4) For tenement houses a central supply of hot water is quite practicable and should be provided universally.

(5) The system of installing separate central-heating plants in each house heated by coke or anthracite should be employed far more widely than is at present the case.

(6) As far as practicable, gas fires or hot water radiators (or electric radiators subject to the question of cost) should entirely supersede the old-fashioned open coal fire; adequate means for proper ventilation being provided.

(7) We are aware that there is still a strong prejudice in many quarters in favour of an open coal fire, and we therefore limit our recommendation to this extent—namely, that in none of the houses built with the assistance of the Government subsidy should more than one, or, in exceptional circumstances, two coal grates be installed.

Whatever coal ranges and coal grates are installed, they should be of a type adapted to the use of coke as well as of coal. Adequate means of regulating the draught should in all cases be provided.

57. In conclusion, we desire to emphasize the fact that the present housing situation affords a unique opportunity for constructive reform with regard to the heating, cooking, and hot-water supply arrangements in domestic dwellings.

58. Reformers in the past have always been confronted with established facts. It was urged, and not without point, that it was impracticable to attempt smoke abatement by altering existing appliances installed in houses constructed on old-fashioned lines.

59. But the position has changed; and having regard to the serious damage caused by domestic smoke, and at the same time to the great improvements which have been introduced into modern systems of heating, we wish strongly to urge on those who are engaged in the preparation of new housing schemes the great importance of providing, as far as practicable, smokeless arrangements for warming rooms, supplying hot water, and for cooking.

60. We are not in a position to recommend the universal adoption of any particular scheme, but we are satisfied that in most instances it will be quite practicable to adopt some arrangement which will obviate the production of smoke.

61. The Ministry of Health and the local authorities, with the aid of the necessary experts, should carefully investigate the relative merits of particular systems in varying circumstances. We think it of great importance that this should be done.

62. We repeat that, even if some small increase in expenditure were involved, this should not deter those concerned from acting on our recommendation. It has been agreed that, for the sake of amenity, only a small number of houses should be provided to the acre, and there can be no doubt that it is of equal national importance to avoid the production of smoke from domestic chimneys.

63. With regard to the question of domestic heating in general, we are struck by the absence of full and scientific knowledge. We think that the whole subject of hygienic and scientific heating deserves a very much greater measure of public attention than it has hitherto received.

VII.—RECOMMENDATIONS.

1. That the central housing authority should decline to sanction any housing scheme submitted by a local authority or public utility society unless specific provision is made in the plans for the adoption of smokeless methods for supplying the required heat, as suggested in the body of this report.

The only exception to this rule should be when the central authority are fully satisfied that the adoption of such methods is impracticable.

2. That gas and electricity undertakers should be given every facility and encouragement to increase and cheapen the supply of gas and electricity, and that the practice at present followed by some municipal authorities of overcharging for gas and electricity in order to allocate the profits thus accruing to the relief of the rates should be discontinued.

3. That the Government should encourage the co-ordination and extension of research into domestic heating generally. This is a matter of great importance in view of the many outstanding problems which demand inquiry.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Leeds Gas Output.

SIR,—With reference to the paragraph relating to the Leeds gas undertaking which appears in the current issue of the "JOURNAL," it is stated that the increase in the quantity of gas sold during last year was 900 million c.ft. This, unfortunately, is an error; the actual increase being only 45 million c.ft.

The gas sold per ton of coal carbonized was the best in the history of the Department, being 13,921 c.ft. per ton, or an increase of 455 c.ft. as compared with the previous year.

As the figures taken from your widely-read Journal are often quoted, I shall be obliged if you will kindly correct in your next issue.

C. S. SHAPLEY,
Engineer and General Manager.

City of Leeds Gas Department,
Sept. 3, 1925.

William Coward.

SIR,—In your issue for Aug. 12 there appeared a notice of the death of my relative, William Coward.

It may be of interest to your readers to know that William Coward (who, as stated, was a barrister by profession) was appointed Agent for the Sydney Gas Company about 1853 or 1854. My father at that time was first Chairman of the then called Sydney Gas Company, and William Coward was a barrister with but little practice. Mr. Coward deserted the active profession of law for what proved in his long life a more lucrative calling, as my father offered him the Agency, and from that day he retained it.

H. S. SMITH-REWSE,
Director of the Whessoe Foundry and Engineering Company, Ltd.

106, *Cannon Street,*
London, E.C. 4,
Sept. 4, 1925.

Electric v. Gas Heating.

SIR,—I regret that the writer of your "Electricity Supply Memoranda" has not found time in his lengthy and circuitous reply to my letter in last week's issue of the "JOURNAL" to answer the two questions I asked him. In view of their "amateurish nonsense," he should find no difficulty in dealing with them in a convincing manner.

I will repeat them for the last time, and must request him to reply to them in a straightforward manner. They are: (1) What becomes of the energy which, he maintains, the electric fire fails to convert into heat? (2) Briefly, in what way does the gas fire propagate 25 p.ct. of convected heat into the room without admitting also the products of combustion?

As your contributor's arguments all depend on these questions, it is useless to discuss the matter if he will not, or cannot, reply to them.

"CUISINIER."

[The answers to our correspondent's questions will be given if he will accept the invitation extended to him last week. We hope he will not fail us in this.—ED. "G.J."]

Atherton Gas Undertaking.—After allowing £1792 for interest and sinking fund, and £710 spent on capital expenditure, the Atherton gas undertaking made a net profit last year of £297. The receipts from the sale of gas amounted to £13,786, a decrease on the previous year of £885; while the yield from residuals showed a decrease of £1386. The quantity of gas produced was 85,385,300 c.ft., an increase of 4,308,900 c.ft.; the total quantity sold being 77,412,400 c.ft. The present price for lighting varies from 3s. 10·8d. to 3s. 6·9d. per 1000 c.ft., and for power 2s. 9d. to 2s. 3·28d., according to the quantity used.

Morpeth Gas Company.—At the annual meeting of the Company, Mr. Ralph Crawford (Chairman) said that the result of the year's working could be considered satisfactory. They had written-off £100 depreciation on meters and cookers, while they had placed to reserve for special renewals of plant the sum of £350. They had placed £150 to general reserve, bringing this fund up to £1300, which would enable them to declare a dividend on their shares for one year in the event of unforeseen circumstances. During the year there had been an increase of 250,000 c.ft. in the gas sold. The slot meter consumption showed a marked increase, and indicated how much workmen appreciated gas as a cheap means of lighting and cooking. Mr. F. E. Schofield moved that dividends of 3 p.ct., less tax (being at the rate of 6 p.ct. for the year), on the preference shares, and 3½ p.ct., free of tax (making 6 p.ct. for the year), on the ordinary shares, be paid. This was carried. Mr. R. Lockey, the Manager and Secretary, was thanked for his good work.

REGISTER OF PATENTS.

Geysers.—No. 238,124.

EWART, J. W., of London.

No. 31,000; Dec. 24, 1924.

This invention relates to geysers of the kind in which the lever handles of the controlling taps on valves for the supply of water and gas interact to prevent the opening of the gas tap before the water valve has been opened, and the closing of the water tap valve before the gas tap has been closed. According to this invention, the gas tap controlling handle is provided with an extension having a surface in a plane at right angles to the axis of the tap, so that when the latter is open, the surface obstructs the path of the handle of the water tap. It prevents the water tap being moved to the closed position, which can be done only when the gas tap is in the closed position.

Atmospheric Gas Burners.—No. 238,048.

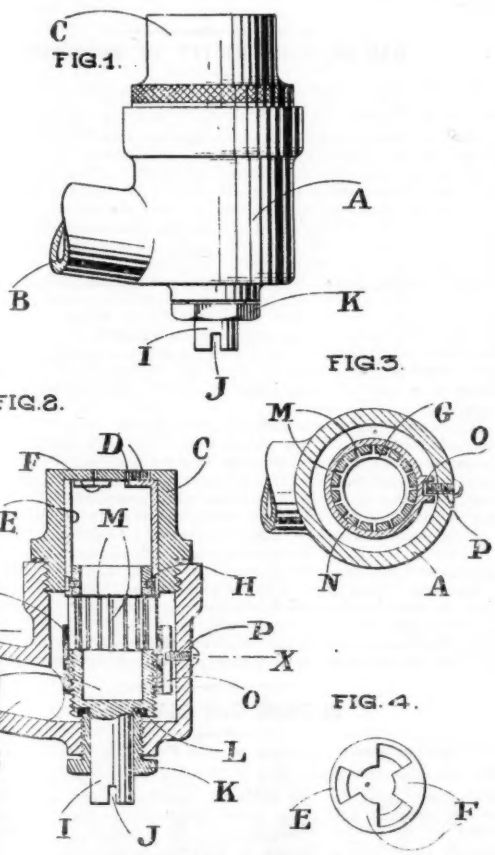
YATES H. J., M. HOWLETT & CO., LTD., and DOLPHIN, J., all of Birmingham.

No. 15,603; June 30, 1924. No. 29,507; Dec. 9, 1924.

This invention relates to atmospheric gas burner jets or nozzles of the kind wherein the gas supply pipe is provided with a sliding valve and a rotatable valve, one of these valves serving to regulate the flow or pressure of gas, and the other valve the area or number of orifices in the jet through which the gas is discharged.

Fig. 1 is a side elevation of an atmospheric gas burner jet or nozzle constructed according to the invention; fig. 2 is a vertical section, fig. 3 a horizontal section on the line X—X in fig. 2, and fig. 4 a plan view of the valve detached.

In the construction illustrated, the apparatus comprises a tubular casing A having a gas inlet port B leading into one side, and a discharge member C screwing into one end; C being provided with a number of orifices D, some of which may be arranged more or less radially so that they can be controlled by a rotary valve E having sector-like portions F adapted, when the valve is rotated, to cover or uncover the orifices.



A New Atmospheric Gas Burner.

The rotary valve is formed conveniently in two portions, an upper part E made in the form of a sleeve having a partially closed end, and a separately formed lower portion G which is retained within the member E by means of set screws H.

The part G is provided at its lower end with a spigot I, which projects through an opening in the lower part of the outer casing, and is provided with a slot or saw cut J for the insertion of the end of a screwdriver. A gland nut K may be provided which screws into the lower end of the casing and operates upon a ring of compressible packing L. By operating the gland nut K, the upper face of the valve member E is forced into engagement with the inner surface of the member C. The lower part G of the valve member has a number of longitudinally arranged slits M around its periphery. These slits may be of the usual parallel construction, or they may be of a tapered or wedge-shaped form. Below the slits M, the part G of the valve is screw-threaded upon its outer surface, to receive a similarly screw-threaded sleeve N. The latter is prevented from turning in relation to the casing A by providing a pair of parallel ridges O upon its outer surface which extend one on either side of a set-screw P which projects radially into the interior of the casing. Preferably only a portion of the inner surface of the sleeve member is screw-threaded; the portion which is not threaded being preferably a sliding fit on the outer surface of the member G.

Regulating Gas Flow from Retorts.—No. 238,102.

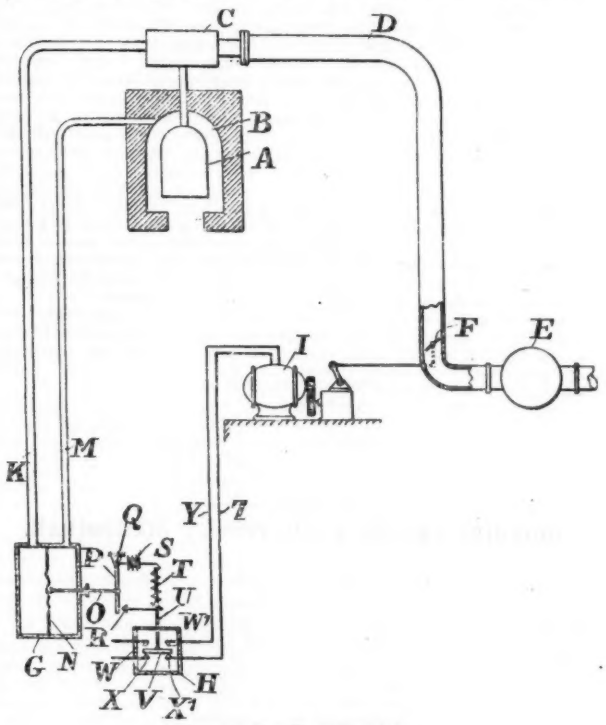
WÜNSCH, G., of Berlin-Steglitz, and ASKANIA-WERKE A. G., vormals Centralwerkstatt Dessau und Carl Bamberg-Friedenau, of Berlin-Friedenau.

No. 26,805; Nov. 10, 1924.

The idea of this invention is to adjust the exhausting of gas by means of a differential pressure regulator, in such a manner as to maintain the same pressure in the retort as in the heating flues. A construction of a plant for use in carrying out the process according to the invention is diagrammatically illustrated in the accompanying drawing.

A gas retort A is heated in a flue B, through which pass the heating gases. The retort A is connected directly, or through a hydraulic main C and a suction pipe D, with any desired exhauster E. In the suction pipe is mounted a throttle valve F.

From the gas retort A or from the hydraulic main C, and the heating flue B surrounding the gas retort, a pipe leads to a differential pressure measuring device G divided by a diaphragm N into two compartments in which terminate two pipes K and M. The diaphragm is connected to an operating lever F movable on the point O by means of a guide-bar O. The lever abuts against a contact



A German Gas Flow Regulator.

R. To this contact, as well as to the lever P, an electrical circuit is connected, into which is inserted a battery S and a solenoid T. Within this latter a rod U consisting of soft iron and carrying at its lower end a contact plate V is provided. The latter is able to close, according to its position, either the two contacts W, W¹, or the two contacts X, X¹, which are connected to two conducting wires Y and Z and are housed in a casing H into which extends also the rod U. The two conducting wires Y and Z run to the motor I; and according as the contacts W and W¹ of the conducting wire Z are closed, and this latter is supplied with current, or the contacts X and X¹ of the wire Y are closed, and this latter is supplied with current, the motor I rotates in one or the other direction, and moves the throttle or butterfly valve F correspondingly.

If, therefore, the pressure of the gas supplied through the conduit K increases, the contact P R will be closed, the solenoid excited, and the contact plate V lifted, whereby the contact W and W¹ will be closed, and the motor caused to rotate in the corresponding direction. If, reversely, the pressure of the fluid supplied through the conduit M increases, the contact P R will be reopened, the contact plate V will fall by its own weight, and the contacts X and X¹ will be closed. in consequence whereof the direction of the motor I will be reversed and the butterfly valve will be turned in the opposite direction. Therefore, as the pressure inside or outside the gas retort becomes greater or smaller, the butterfly valve is operated in one or the other direction. As soon as the pressure in the interior of the gas retort increases, the motor I will be switched so that the butterfly valve

will open more fully, and an increased withdrawal will take place until the pressures are balanced. If the pressure in the heating flues outside the gas retort rises, the butterfly valve will close in order to insure a corresponding increase of pressure in the interior of the gas retort by a correspondingly smaller gas withdrawal.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Sept. 2.]

Nos. 21,100-21,712.

DAVEY, F.—"Method of manufacturing carbon black from gas." No. 21,638.

DEAN, W.—"Gas washing-boilers, &c." No. 21,191.

DEMPSTER & SONS, LTD.—R.—"Handling of materials." No. 21,177.

FRANKL, M.—"Distillation of carbonaceous material." No. 21,158.

HUTZ, H.—"Distilling, &c., bituminous materials." No. 21,301.

KOPPERS COMPANY.—"Coke ovens, &c." No. 21,706.

LODGE-COTTRELL, LTD.—"Electrical gas purification." No. 21,674.

ORKLA GRUBE-AKTIEBOLAG.—"Treatment of gases containing sulphuretted hydrogen and sulphur dioxide." No. 21,448.

POMEROY, A. J.—"Gas boiling-stoves." No. 21,538.

PROCTOR, E. A.—"Bunsen, &c., burners." No. 21,551.

PROCTOR, E. W.—See Proctor, E. A. No. 21,551.

READ, W.—"Gas mantle burners." No. 21,567.

STOREY FOUNDRY CO., LTD.—"Gas burners for kitchen-range boilers." No. 21,112.

STOREY, J. E.—See Storey Foundry Co., Ltd. No. 21,112.

WALTON, C.—"Bunsen burners for fish, &c., frying pans." No. 21,348.

WALTON, T.—See Walton, C. No. 21,348.

WILLIAMS, A. H. T.—"Gasholders." No. 21,154.

MISCELLANEOUS NEWS.

MANCHESTER GAS DEPARTMENT.

Increase in Price of Gas.

The report of the Gas Committee and the Finance Committee, proposing an increase of 4d. per 1000 c.ft., or 0·89d. per therm, in the price of gas for all supplies other than street lighting raised some opposition at a meeting of the Manchester City Council on Sept. 2.

Alderman Kay, proposing its adoption, said the increase was necessary in order to keep the gas undertaking in a sound financial condition. It was the case with all the gas undertakings of the country, whether privately or municipally owned. While the fall in the price of coal had saved the Department some thousands of pounds, the drop in the market value of the bye-products had produced £134,000 less than in 1924. It was reassuring to know, however, that, in spite of the state of trade, there was still an increase to report in the demand for gas. It should be remembered, too, that the advantages given by the Department to consumers in the way of free meters, cookers, and the like, were worth quite 6d. per 1000 c.ft. on the price of gas, and that the users of prepayment meters were only paying the same price as the users of quarterly meters, whereas in practically every other undertaking there was a difference of 6d. to 8d. per 1000 c.ft. The Committee had been accused of having made a loss. Up to the present there had been no loss; and at the end of the year they expected to have a level balance. Considering that the Department had contributed something like 3¾ millions sterling in reduction of the rates, he thought they were to be congratulated on the low indebtedness.

Councillor Annie Lee said that on previous occasions they had been led to expect that the bye-products in the production of gas would become so remunerative that it would be possible to supply the gas itself free. Was it desirable, she asked, that they should continue to manufacture the bye-products at a loss?

Councillor Hart reminded the Council that if the 3¾ millions contributed to the city rates had been used for paying-off the capital borrowed by the Gas Committee, the Committee to-day would not be requiring money for sinking fund and interest.

The report was approved by a substantial majority.

BUILDING TRADES EXHIBITION AT BIRMINGHAM.

The Birmingham and Midland Allied Trades Exhibition was opened on Monday at Bingley Hall, Birmingham. Nearly 150 firms are represented in the exhibition, which will remain open until Sept. 19.

A display of considerable interest to architects and builders and others concerned in housing schemes is made by the City of Birmingham Gas Department. It consists very largely of labour-saving gas appliances for the home; care being taken to show various appliances correctly fitted, and with properly designed flue outlets. The Birmingham Gas Department have for many years recognized the great service which is rendered to the community in a large city by its architects and builders. Birmingham has been fortunate in this respect, and holds a forward place in all modern housing developments. The Gas Department have successfully co-operated with architects in the question of the fitting of gas supplies and gas appliances in new property; and the authorities hope that the great strides which have been made in recent years in this direction are helping to abate the smoke nuisance. Prominence is given to gas-heated wash boilers. These, of various types, are shown to take the place of the old-fashioned brick-built coal-heated boiler. The all-cast rustless type, which is peculiarly suited for housing schemes, is displayed, together with a properly designed flue outlet for removing the waste gases and steam. A good deal of attention is attracted by a built-in gas grate, consisting of a gas fire, mantel, and hearth combined in one unit. It is an improvement on the method so often adopted of fixing a gas fire in front of an existing coal grate. In addition to the better appearance, it saves building costs, in that no special hearth and hearth trimmers are required.

Many types of gas cookers are shown, as well as gas-heated hot water apparatus, geysers, and circulating boilers. In connection with the circulating boilers a thermostatic device is demonstrated for automatically lowering the gas when the water in the storage is sufficiently heated.

The Pollard Engineering Company, Ltd., of Shaftesbury Avenue, London, show models of their safety geyser; the working principle being that the cold water, after flowing up an outer jacket of the geyser, falls by gravity over a number of trays arranged in the interior, and flows out at the bottom through the spout. The burner is of the blue-flame type, and by its use economy in gas consumption is claimed. "Leamington" gas cookers, with Flavel patent burners, are displayed by Messrs. G. Matthews, Ltd., of Birmingham. The "Maisie" gas radiator and gas cooker are featured by Mr. Henry Jones, of Walthamstow. Boyle's patent water heaters for gas and oil are also shown; and gas water heaters for bath purposes are exhibited by the Hurry Water Heater Company, of Birmingham.

Lectures were arranged to bring to the notice of architects and the public the service that can be rendered by gas in modern homes. Last night, Mr. W. M. Mason dealt with "Gas in the Service of the Community, with special reference to Its Application in New Buildings," and what he had to say will be found elsewhere in this issue. Next Monday's lecture will be on "How the Gas Industry may assist the Builder and Architect—Practical Hints and Information on the Application of Gas Appliances in Modern Buildings," by Mr. R. J. Rogers, of Birmingham; and on Friday, Sept. 18, Mr. R. G. Marsh, of Birmingham, will speak on "The Provision of Hot Water by Gas."

GAS OR ELECTRICITY AT ROCHDALE.

At a meeting of the Rochdale Town Council on Tuesday, Sept. 1, Alderman Blomley drew attention to a resolution of the Housing Committee that tenders for the lighting and heating services for houses on the Clarke's Lane estate be obtained on the basis that "only electricity services will be provided." This matter, he said, had come before the Gas and Electricity Works Sub-Committee the previous evening. In view of the fact that the provision of electricity only in the new Kilworth Street houses was merely an experiment, the Sub-Committee felt that they ought to wait until they knew the result of that experiment before they extended the same thing to another housing site. He therefore moved that the resolution be referred back for further consideration. Supposing some of the tenants demanded gas, he thought the Town Clerk would advise the Corporation that they were under obligation to supply them with it. There was also the fact that it was far more economical to lay mains and cables for both services while the streets were "in the raw," rather than have to instal another service after the paving had been completed.

Alderman Diggle seconded the amendment.

Mr. Wycherley did not think there was any need to take the resolution back. The Housing Committee understood that they would have experience of the all-electricity houses at Kilworth Street before the houses at Clarke's Lane were completed. If that experience showed that it would be advisable to instal both services, this could be done at Clarke's Lane without any trouble.

Alderman Clark urged that the minute should be taken back. The Committee had very strong ideas about the "all-electricity" houses at Kilworth Street being only an experiment. Before binding themselves to anything beyond that they certainly ought to have information as to how the experiment had resulted.

Mr. Wycherley agreed to withdraw the resolution; and with that exception the minutes of the Housing Committee were passed.

BOGNOR GAS COMPANY.

At the half-yearly meeting of the Company Mr. J. G. Denton, J.P., occupied the chair, and in moving the adoption of the report and balance-sheet for the half-year ended June 30, said that since the war Bognor had made great progress, and the Company had shared in its increased prosperity. As a result of the half-year's working there was a balance of £13,839 to the credit of profit and loss account, and the Directors recommended that a dividend at the rate of £6 15s. p.ct. per annum be paid on the original "A" stock, and £7 9s. p.ct. on the original "B" stock. Upon the additional "A" stock they recommended a dividend of £6 15s. p.ct., and on the new consolidated stock £6 15s. p.ct. These dividends would absorb £2694, leaving a balance of £11,144 to the credit of the profit and loss account. There had been a steady increase in the demand for gas and electricity throughout the Company's districts; there being recorded an increase of over 8 p.ct. in gas and 12 p.ct. in electricity, as compared with the corresponding period of last year. New workshops and stores were now in the course of erection, part of the cost of which had been debited in this half-year's accounts. The report was adopted, and the dividends were agreed to.

GAS REGULATION ACT APPLICATIONS.

The following notice has appeared in the "London Gazette" regarding applications to the Board of Trade under the Act.

DECLARATION OF CALORIFIC VALUE.

Haverfordwest Corporation.—420 B.Th.U. (Nov. 1.)

SHREWSBURY GAS LIGHT COMPANY.

The annual meeting of the Company was held on Tuesday, Sept. 1—Mr. J. B. Lloyd, the Chairman, presiding.

The report of the Directors for the year ended June 30 stated that the profit amounted to £7103. After allowing for the interim dividend of 2½ p.ct. (less tax) paid in March, and the interest on mortgages, the net balance of profit and loss available amounted to £10,123. A final dividend of 3½ p.ct. (less tax), making 6 p.ct. for the year, was recommended. It was stated that the reserve fund now stood at £13,536, and the special purposes fund £4146. There had been an increase of 5 million c.ft. in the sales of gas. The number of cookers on hire at June 30 was 4421, together with 1584 fires. There were also 3449 ordinary and 5049 prepayment meters in use.

The CHAIRMAN, moving the adoption of the accounts, said that the capital expenditure upon the works during the last two years included the provision of a new chemical laboratory, a machine tool shop for repair work, a waste-heat boiler in connection with the vertical retorts, and a duplicate set of steam-driven gas compressors for the purpose of augmenting the low-pressure supply in certain parts of the town. Extensions and enlargements of mains in various districts had also been carried out following upon the development of building sites. Speaking generally, the results of the year's working were eminently satisfactory. Sales had not only been maintained, but had been substantially increased in the face of keen competition. The number of cookers and fires on simple hire had been increased by 322, while 489 gas appliances for heating, cooking, and hot water supply had been sold outright, or on the hire-purchase system, during the year. The receipts from the sale of gas had increased by £1051; the total receipts being £2312 more than last year. On the expenditure side, carbonizing costs and works repairs were affected by an increase in workmen's wages, which took place in January last. Good relations with the Company's employees had been maintained, aided by the co-partnership scheme, which had enabled many employees to become shareholders; the total amount of stock thus held now exceeding £3000. The gross profit was £1348 less than last year, but the net profit was more than sufficient to pay all loan capital charges, and allow the declaration of a final dividend of 3½ p.ct. In view of the reduction which would be effected in the expenditure upon repairs of works during the ensuing year, a decrease of 1d. per therm in the price of gas had been decided upon by the Directors, to take effect from the reading of the meters for the June quarter.

The report was adopted, and the resolution authorizing the payment of the dividend was carried.

THE "BERGIN" PROCESS IN GERMANY.

Projected Developments.

It is a fact, states the Berlin Correspondent in a recent issue of the "Financial Times," that already 20 million marks have been spent on investigations of the "Bergin" process patented by Prof. Bergius; and it is asserted that the British Government subscribed £25,000 towards research by the inventor, while several well-known British firms have assisted the investigations financially and still have chemists taking part in the experiments at Mannheim-Rheinau. The success of the process has already been established on a small scale. The question at issue to-day is whether plant can be devised and constructed on an industrial scale capable of yielding a high enough percentage of oil to make the process remunerative.

The "Bergin" process in theory is simple. Any kind of coal may be taken and crushed fine, the meal so obtained being then mixed with oil residues left over from a previous operation. This mass is heated to from 400° to 500° C. in an atmosphere of hydrogen under a pressure of about 150 atmospheres. The mixture is kept stirred, and in a short time is converted into a syrupy mass, from which the oils may be separated.

PLANT DIFFICULTIES.

The difficulty is to build large plants that will enable the working conditions of high temperature and pressure to be maintained continuously. At a temperature of 500° C., iron or steel, of which the chambers are made, tends to alter its properties and to soften. The chambers have to be of considerable size. Those at Mannheim are 25 ft. long and cylindrical in shape. The greatest difficulty of all, however, is to bring the oil, once formed, from a pressure of 150 atmospheres down to one atmosphere without interrupting the process. To solve the latter difficulty, it is proposed to employ valves such as are used at Leuna, in Germany, in the nitrogen fixation process. These valves are very expensive and complicated, and are likely to wear rapidly. Sceptics go so far as to say that the whole "Bergin" plant, in order to meet the difficulties already pointed out, will be so complicated that it will have to be completely renewed at the end of about three years. For this reason alone, it is said, the process will become too costly.

PRUSSIAN GOVERNMENT SCHEME.

The situation in the coal trade in Germany is so desperate that the Prussian Diet is deliberating the plan of financing the erection of an industrial plant at Waldenburg, in Lower Silesia, at the Wenzel Mine, under the direction of Herr Dr. Gärtner, for trying the "Bergin" process on the "dust" coal peculiar to Silesia. For this coal there is at present no sale. It should be mentioned that, where the coals are chemically similar, the light crumbling coal is far more suitable for the "Bergin" process, because it costs less for crushing. The plant has not been finally adopted, because the patentees are not yet prepared to accept the terms of the Prussian Government for the right to acquire by direct financial participation a substantial interest in all future plants erected in Germany if the experiment proves a success. Were the "Bergin" process already beyond the stage of experiment, as the enthusiasts declare, there would be no need for its owners to consider such demands from the Prussian Government.

The small experimental plant at Mannheim consists of two cylinders, each 25 ft. long, in which the coal-dust paste is kept stirred by a screw propeller, and hydrogen, in the form of water gas, is pumped through under high pressure. A full-sized plant unit would consist of four cylinders, three in continuous use and one in reserve for emergencies. The scheme under consideration by the Prussian Government is the erection at Waldenburg of one unit of four cylinders; and the preliminary cost would be 2½ million marks. Should the plant give promising results, it would be increased to four units—16 cylinders—at a cost of about 10 million marks. It is estimated that the four-cylinder plant would be capable of treating 20,000 tons of coal per year.

TRADE NOTES.

George Waller & Son, Ltd.

The firm have recently received orders for their "Retriever" pan ash separating plant from Luton, Deal, Colwyn Bay, and Manchester; making up a total of 29 installations in the last eighteen months.

A New Gas Fire Catalogue.

Messrs. R. & A. Main, Ltd., have published an illustrated catalogue of their gas fires for the 1925-26 season. The publication, which contains 47 pages, shows a wide variety of designs and finishes, enabling complete harmony with any existing scheme of decoration to be ensured.

Cooking Apparatus for a Hotel in South Africa.

The Richmond Gas Stove & Meter Company, Ltd., have received instructions to provide special cooking apparatus for the Union-Castle Steamship Company. The equipment is to be forwarded to South Africa, and installed in one of the hotels belonging to this important Company.

Burners and Glassware.

A burner and glassware catalogue for the coming season has just been issued by Lighting Trades, Ltd., of Nos. 51 to 57, Garratt Lane, Wandsworth, S.W. 18; and this is now available for distribution. In addition to numerous black and white illustrations, there is a coloured plate depicting some examples of the firm's "Silk-Ray" globes for inverted burners. These globes are made of glass possessing a beautiful matt finish which resembles silk.

A New Gas Fire Booklet.

The new booklet of "Richmond's Silent Gas Grates," just issued, worthily maintains their high reputation for artistic and attractive advertising literature, which has proved so helpful to gas salesmen in the past. This publication contains 48 pages of interesting information; prominence being given to the excellent series of "Period" and "Standard" designs. These fires are constructed with the Radiation patent injector-ventilator and standardized parts. Grates finished in Richmond's special "Lustre" shades are listed at the same price as for copper-bronze finish; and the exceptional demand experienced last year for fires in these metallic shades already bids fair to be exceeded this winter. The new list contains many beautiful examples of fires in mantels, while a folder at the back of the book provides a pleasing pictorial display of actual rooms into which gas fires have been fitted. Supplies of Richmond's new booklet (No. 3880) may be had from the Advertising Department, the Richmond Gas Stove & Meter Company, Ltd., Nos. 164-172, Queen Victoria Street, London, E.C. 4.

CONTRACTS OPEN.

Pipes.

The Winsford Urban District Council are inviting tenders for the supply of cast-iron gas pipes. [See advert. on p. 625.]

Dismantled Plant.

Owing to their decision to reconstruct and extend the vertical retort installation at their Albert Road Gas-Works, as occasion requires, the Darlington Corporation Gas Department have authorized their engineer to dismantle and dispose of the material from the horizontal retort house fitted with stoking machinery at their John Street Works. [See advert. on p. 625.]

Imperial Continental Gas Association.—The Board of Directors of the Imperial Continental Gas Association intend shortly to declare, out of the ascertained profits of the half-year ended June 30 last, an interim dividend at the rate of 5 p.ct. actual, on the £1,976,000 capital stock of the Association, payable, less income-tax at 4s. 1½d. in the pound (*i.e.*, the rate for the year 1925), on Nov. 16.

National Institute of the Blind.—The annual report for the year ended March 31 has just been published. If a comparison is made between this document and a report (say) of any institution for the blind fifty years ago, one is astonished at the marvellous progress that has been made in all ameliorative work for the blind. Extensions of the Institute's work during the year included the opening of a third Blind Babies' Home at Leamington Spa, and the establishment of a Convalescent and Holiday Home at St. Leonards-on-Sea.

STOCK MARKET REPORT.

QUIET and uninteresting conditions prevailed on the Stock Exchange last week. Various factors contributed to the general depression, such as the trouble in the shipping world, the nervousness in regard to the labour outlook, and the imminence of the carry-over. On the other hand, the announcement that the British Government had resumed diplomatic relations with Mexico created quite a scramble for Mexican stocks, and Brazilian issues were also prominent. The gilt-edged market was firm, and War Loan has again touched 102.

Industrials were inactive, and the popular shares which have received much support during the past few months are suffering from repletion. Inquiries on the Provincial Markets revealed similar conditions, there being no outstanding features in any of the exchanges.

The Gas Market was no exception to the rule; the only important change being a drop of two points in Tynemouth Consolidated and New at 72-74. Two further interim dividend announcements have been made—viz., Imperial Continental Gas Association at the rate of 5 p.c. (actual), and Hastings and St. Leonards, who are distributing £6 15s. p.c. per annum on the 5 p.c. Converted Stock, and £5 5s. p.c. per annum on the 3½ p.c. Converted Stock. In the case of both companies these rates are the same as a year ago. The impression is that generally prices have touched low-water mark and will benefit from any improvement in the financial position, and ultimately from the advantages that will accrue under the sliding-scale from price of gas reductions.

The following transactions were recorded during the week:

On Monday, Aldershot "C" 76½, Alliance and Dublin 64½, Gas Light and Coke 80, 80⅛, 80⅛, Hastings and St. Leonards 3½ p.ct. converted 76, Imperial Continental 150, 151, Maidstone 5 p.ct. 123 *ex* div., Primitiva 9s., 9s. 6d., 4 p.ct. debenture (1911) 65, 65⅝, San Paulo 6 p.ct. preference 8, 8⅛, South Metropolitan 91½. Supplementary prices, Cape Town and District 5 p.ct. mortgage debentures 77.

On Tuesday, Alliance and Dublin 65, 65⅛, Bombay 19s. 6d., Brentford "A" 94, Cape Town 4½ p.ct. preference 5⅛, 6, Continental Union 37, Gas Light and Coke 80, 80⅛, 4 p.ct. preference 77, 78, Primitiva 9s., South Metropolitan 90⅜, 91, Southampton 81½. Supplementary prices, Brighton and Hove 7 p.ct. new debenture 105½.

On Wednesday, Bournemouth "B" 12⅛, Brentford "A" 94½, Bristol 5 p.ct. maximum 89½, Commercial 4 p.ct. 80, European, 7⅜, Gas Light and Coke 80, 80⅛, 80⅜, 80⅝, 3½ p.ct. maximum 61½, 4 p.ct. preference 77⅜, 3 p.ct. debenture 60⅜, Hastings and St. Leonards 3½ p.ct. converted 76, Imperial Continental 149, 149½, 150, Primitiva 9s., South Metropolitan 90½.

On Thursday, Brentford "A" 94⅜, Continental Union 38⅝, 38⅛, Gas Light and Coke 80, 80⅛, 80⅜, 80⅜, 3½ p.ct. maximum 61½, 3 p.ct. debenture 60, Hastings and St. Leonards 3½ p.ct. converted 75, Malta and Mediterranean 86s. 3d., 88s. 0d., Primitiva 9s. 1⅛d., 9s. 3d., 9s. 3⅜d., South Metropolitan 91½. Supplementary prices, Malta and Mediterranean 2nd (7½ p.ct.) preference 97s. 6d., 100s.

On Friday, British 107, 109, Commercial 4 p.ct. 80, Gas Light and Coke 80⅛, 80⅜, 80⅛, 80⅝, 3½ p.ct. maximum 60½, 4 p.ct. preference 77⅛, 78, Imperial Continental 149½, 150⅛, Primitiva 9s. 6d., South Metropolitan 91⅛, 91⅜, 91½, 91⅜. Supplementary prices, Malta and Mediterranean 1st (7 p.ct.) preference 5, 5⅛.

There was an abundant supply of money in Lombard Street. Rates for existing loans remained unaltered, but fresh money was almost unlendable, supplies being offered at 2½ p.ct. Discount rates, however, were firm, and Treasury Bills were allotted at practically the same average percentage as the previous week.

In the Foreign Exchange Markets the movements were very slight. Both French and Belgian francs showed trifling changes only. The former closed at 103.37½, and the latter at 108.87½. The new Italian exchange regulations resulted in a further appreciation of the lira, which closed 1/16ths down at 121⅜. Sterling on New York closed 1/32 to the good at $4.84 27/32.

There were further sales of gold by the Bank of England, but the price was unaltered at 84s. 11½d. per oz. Silver was again firm, and the cash price was quoted 1/16d. higher at 33 7/16d. per oz.

The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct., on Aug. 6. Bankers' deposit rates are 2½ p.ct. The deposit rates of the discount houses are 2½ p.ct. at call and 2¾ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Sept. 4.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Aug. 13	5	5	Aldershot 5 p.c. max. C.	75—78	..	76½
295,492	,,	,,	4	4	Do. 4 p.c. Pref.	69—74	..	..
1,551,868	,,	Apl. 2	6½	6½	Alliance & Dublin Ord.	63—68	..	64½—65½
374,000	,,	July 9	4	4	Do. 4 p.c. Deb.	60—65	..	..
300,000	1	May 7	1/7½	1/7½	Bombay, Ltd.	½—1	..	19/6
170,000	10	Aug. 13	8½	8½	Bournemouth 5 p.c.	12—13	..	..
425,050	10	,,	7	7	Do. B 7 p.c.	12—12½	..	12½
150,000	10	,,	6	6	Do. Pref. 6 p.c.	11—12	..	..
50,000	Stk.	June 25	3	3	Do. 3 p.c. Deb.	36—39	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	77—80	..	..
992,045	,,	July 9	6 1/10	6 1/10	Brentford A Con.	93—98	..	94—94½
990,500	,,	,,	6½	6½	Do. B New	93—98	..	..
76,000	,,	,,	5	5	Do. 5 p.c. Pref.	94—97	..	..
306,690	,,	June 11	4	4	Do. 4 p.c. Deb.	75—80	..	..
181,337	,,	,,	6	6	Do. 6 p.c. Rich. Red. Deb.	100—105	..	..
214,740	,,	Aug. 27	12½	12	Brighton & Hove Orig.	161—166*	..	..
244,200	,,	,,	9½	9	Do. A Ord.	119—122*	..	..
1,287,500	,,	July 23	5	5	Bristol 5 p.c. max.	89—91*a*	..	89½
855,000	,,	Mar. 19	8	7	British Ord.	105—110	..	107—109
100,000	,,	June 25	7	7	Do. 7 p.c. Pref.	120—125	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	71—76	..	..
100,000	10	May 21	6	8	Cape Town, Ltd.	6½—7½	..	..
100,000	10	Apl. 23	4½	4½	Do. 4½ p.c. Pref.	5½—6½	..	5 15/16—6
150,000	Stk.	June 25	4½	4½	Do. 4½ p.c. Deb.	69—74	..	..
626,860	,,	July 23	6	6	Cardiff Con. Ord.	98—101	..	..
237,860	,,	June 25	7½	7½	Do. 7½ p.c. Red. Deb.	101—104	..	..
137,150	,,	Aug. 13	6½	5	Chester 5 p.c. Ord.	88—93*b*	..	..
1,513,280	,,	July 23	5/14/8	5⅛	Commercial 4 p.c. Cap.	80—85	..	80
560,000	,,	,,	5⅜	5/3/4	Do. 3½ p.c. Cap.	80—85	..	..
475,000	,,	June 11	3	3	Do. 3 p.c. Deb.	56—59	..	..
800,000	,,	14 Jan. 15	—	—	Continental Union, Ltd.	35—40	..	37—38 1/16
200,000	,,	June 11	7	7	Do. 7 p.c. Pref.	88—91	..	..
660,000	,,	Aug. 13	6½	6½	Croydon sliding scale	96—100	..	..
284,975	,,	,,	5	5	Do. max. div.	81—84	..	..
492,270	,,	Aug. 13	9	6	Derby Con.	107—109*c*	..	..
55,000	,,	June 25	4	4	Do. Deb.	74—76*c*	..	..
1,002,180	10	July 23	4	6	European, Ltd.	6½—7½	..	7 1/16
16,460,070	Stk	Aug. 13	5½	5½	Gas Light & Coke 4 p.c. Ord.	80—82	..	80—80⅝
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	60—63	..	60⅛—61⅛
4,062,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	77—80	..	77—78
4,761,930	,,	June 11	3	3	Do. 3 p.c. Con. Deb.	58—61	..	60—60⅛
130,000	,,	—	10	10	Do. 10 p.c. Bonds	..	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 19	6½	6½	Hastings & St. L. 5 p.c. Conv.	92—97	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	73—78	..	75—76
70,000	10	May 7	10	10	Hongkong & China, Ltd.	17½—18½	..	..
86,600	Stk.	Aug. 13	10	10	Hornsey 7 p.c.	132—137	..	..
1,976,000	,,	May 21	10	59	Imperial Continental Cap.	148—153	..	149—151
226,170	,,	Aug. 13	3½	3½	Do. 3½ p.c. Red. Deb.	70—73	..	..
235,242	,,	Aug. 13	6½	6½	Lea Bridge 5 p.c. Ord.	94—99	..	..
2,127,340	,,	Aug. 13	5½	5½	Liverpool 5 p.c. Ord.	82½—83½*b*	..	83
600,000	,,	Mar. 19	7	7	Do. 7 p.c. Red. Pref.	104—106*b*	..	..
165,736	,,	Aug. 27	8	9	Maidstone 5 p.c. Cap.	118—128*	..	123
63,480	,,	June 25	3	3	Do. 3 p.c. Deb.	55—60	..	..
75,000	5	June 25	3	7	Malta & Mediterranean	4—4½	..	86/3—88/9
541,920	Stk.	June 11	4	4	Montevideo, Ltd.	65—69	..	..
2,061,315	,,	Aug. 13	5	5	Newcastle & Gateshead Con.	71—72*d*	—½	..
300,929	,,	,,	4	4	Do. 4 p.c. Pref.	75½—76½*d*	..	..
529,705	,,	June 25	3½	3½	Do. 3½ p.c. Deb.	66—68*d*	..	..
15,000	,,	Aug. 27	12	12½	North Middlesex 10 p.c.	—*	..	..
75,940	,,	,,	8⅜	8 9/16	Do. 7 p.c.	—*	..	..
300,000	Stk.	May 7	9	7	Oriental, Ltd.	100—105	..	..
188,120	,,	June 25	7½	7½	Plym'th & Ston'house 5 p.c.	108—113	..	..
60,000	50	Aug. 27	14	14	Portsea Island B	93—96*	..	..
100,000	50	,,	13	13	Do. C	90—95*	..	..
2,289,909	1	—	—	—	Primitiva Ord.	8/9—9/9	..	9/-—9/6
302,600	100	June 2	4	4	Do. 4 p.c. Red. Deb.	78—80	..	..
600,000	Stk.	July 23	4	4	Do. 4 p.c. Red. Deb. 1911	62—64	..	65—65⅜
193,744	,,	June 25	4	4	Do. B. Aires 4 p.c. Rd. Db.	63—65	..	..
264,496	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	63—65	..	..
150,000	10	Mar. 19	6	6	San Paulo 6 p.c. Pref.	7⅜—8⅛	..	8—8⅛
125,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	42—45	..	..
270,000	Stk.	Mar. 19	5½	5½	Sheffield A	103—104*s*	..	..
419,968	,,	,,	5½	5½	Do. B	103—104*s*	..	..
1,047,000	,,	,,	5½	5½	Do. C	103—104*s*	..	..
90,000	10	June 11	6	4	South African	7—9	..	..
6,609,893	Stk.	Aug. 13	6½	5	South Met. Ord.	90—92	..	90½—91⅝
1,895,445	,,	July 9	3	3	Do. 3 p.c. Deb.	57—60	..	..
734,000	,,	Mar. 5	6½	6½	Do. 6½ p.c. Red. Deb.	102½—104½	..	..
91,500	,,	Aug. 13	8½	8½	South Shields Con.	132—133*d*	..	..
1,187,795	,,	July 23	6½	6½	South Suburban Ord. 5 p.c.	92—97	..	..
368,837	,,	June 25	5	5	Do. 5 p.c. Deb.	95—98	..	..
647,740	,,	May 7	5	5	South'mpt'n Ord. 5 p.c. max.	80—83	..	81½
121,275	,,	June 25	4	4	Do. 4 p.c. Deb.	70—75	..	..
250,000	,,	Aug. 27	7	7	Swansea 7 p.c. Red. Pref.	100—102*	..	..
200,000	,,	June 25	6½	6½	Do. 6½ p.c. Red. Deb.	101—103	..	..
120,000	,,	July 23	8	7½	Tottenham District A 5 p.c.	113—116	..	..
882,275	,,	,,	6½	5½	Do. B 3½ p.c.	87—92	..	..
150,000	,,	July 9	—	28/4	Do. 5½ p.c. Pref.	103—105	..	..
181,255	,,	June 11	4	4	Do. 4 p.c. Deb.	76—79	..	..
258,251	,,	Mar. 19	5	5	Tynemouth Con. and New	72—74	—2	..
197,294	,,	Aug. 27	6½	6½	Uxbridge, Maidenhead, & Wycombe 5 p.c.	93—98*	..	..
88,330	,,	,,	5	5	Do. 5 p.c. pref.	93—98*	..	..
91,800	,,	,,	6½	6½	Do. 5 p.c. Maidenh'd	88—93*	..	..
30,000	,,	July 9	9½	8½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	125—130	..	..
255,636	,,	,,	7½	7	Do. B 3½ p.c.	107—112	..	..
392,955	,,	,,	6/9/6	5/19/0	Do. C and New	93—96	..	..
352,000	,,	,,	7⅜	6½	Wimbledon 5 p.c.	100—105	..	..
98,000	,,	,,	7⅜	7½	Epsom 5 p.c.	109—112	..	..
88,416	,,	June 25	3	3	3 p.c. Deb.	56—59	..	..

Quotations at:—*a*,—Bristol; *b*,—Liverpool; *c*,—Nottingham. *d*,—Newcastle; *s*,—Sheffield. * Rx; div;

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NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

The hopes which were freely expressed in the previous week of expansion in the export trade have not as yet been realized. There is still a certain amount of inquiry from the Continent, which appears to be more with the object of sounding the market than of passing definite orders. With many classes of coal down to pre-war prices, it would seem that a fair share of any business which may be in the market would come to this country. Apparently there is still very little.

Through lack of support, prices have in some cases weakened still further, and Durham unscreened coking has been done at 13s., so poor is the demand. Merchants have sold second-class gas coals forward up to the end of October next year at a figure delivered Hamburg which implies their belief that there will be no improvement in prices. Many people, however, are still of the opinion that bottom has been reached, and it is difficult to see how any collieries could carry on at lower levels, though this has been said so often in the last two years that buyers will need a good deal of convincing.

Nominal quotations are 17s. 6d. for Wear Special gas, and 17s. for best qualities, though both are probably obtainable at 16s. 6d. Seconds are 13s. 6d. to 14s. 6d. Best Durham bunkers are about 14s. 6d.

Though a certain number of collieries have reopened, it has been announced at the week-end that others are being forced to close down through lack of trade. This should dispel the idea that the subvention means a guaranteed profit to the owners.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

The emergency supplies of coal are far from being absorbed. There is an appreciable slowing down of output, and in some directions prices are weakening owing to the glut. Collieries are on their guard against concessions which would impair the forward position. They prefer to curtail output in correspondence with present market conditions rather than attempt artificial stimulants which must further disorganize the market. Gas undertakings are asking for deliveries to be cut down till a more just balance is restored between stocks and consumptive requirements. Throughout the district the railways are encumbered with coal which has been standing in trucks for weeks. Heavy liabilities have been incurred for rolling stock and demurrage. Many of the merchants are badly hit. They are endeavouring to cut their losses by selling out at the best price obtainable, as much of the coal is unsuitable for stacking; and to aggravate the wastage that has already been entailed, and in addition to incur extra handling costs, would only make their last case worse than the first. Householders have more coal in their cellars than at this time last year. Stocks on merchants' wharves are smaller. There is still some demand for good grade fuels, but concessions have to be made on second qualities. Nuts, beans, and slacks are accumulating, and values suffer accordingly.

Reliable grades of blast-furnace coke are generally quoted at from 13s. to 14s.; seconds can be bought down to 10s., at the ovens.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

There is little of importance to report in regard to the Yorkshire and Lancashire coal trade this week. The colder weather will bring forward the usual autumn demand, and it is expected that collieries will work rather better time in consequence. The stocks of industrial fuel recently accumulated are becoming depleted, and although the various consuming trades do not appear to have better prospects in the immediate future, there will be more regular deliveries required from now onwards. The iron and steel situation is unaltered; and although there is a more hopeful tone prevailing, nothing definite is in view.

Gas coals are moving rather better under contract on account of the altered weather conditions.

The export section shows no sign of improvement, with discounted prices for the majority of qualities, although some of the better grades of washed nuts are holding their own.

The commoner coals are not fetching anything like the cost of production, and if there is no alteration it appears certain that the Chancellor of the Exchequer's idea of a deficit will be very wide of the mark.

Prices at Hull at the week-end were, f.o.b. usual shipping ports: South Yorkshire.—Hards, Association, 19s. 3d. to 19s. 6d.; screened gas coal, 17s. 6d. to 18s.; washed trebles, 13s. 6d. to 18s.; washed doubles, 17s.; washed singles, 15s. to 15s. 6d.; washed smalls, 12s. 3d. to 12s. 6d.; unwashed doubles, 15s.; rough slack, 10s. to 10s. 3d.; smithy peas, 17s. to 18s. 6d. West Yorkshire.—Hartleys, 16s. 6d. to 17s.; screened gas coal, 17s. to 17s. 6d.; washed trebles, 17s.; washed doubles, 15s. 6d.; washed singles, 14s. 6d.; washed smalls, 11s. 6d. to 12s. 6d.; unwashed trebles, 16s. 6d.; unwashed doubles, 12s. to 13s.; rough slack, 10s. 6d.; coking smalls, 10s. Derbyshire and Nottinghamshire.—Top hards, 19s. 6d. to 21s.; washed trebles, 18s.; washed doubles, 16s. 6d. to 17s.; washed singles, 15s. 6d. to 16s.; washed smalls, 11s. to 12s. 6d.; unwashed doubles, 13s. 6d. to 14s.; rough slack, 9s. 6d. to 10s. 3d. Yorkshire, Derbyshire, and Nottinghamshire.—Screened steam coal, 14s. to 17s.; gas coke, 18s. to 22s.; furnace coke, 19s. 3d. to 20s. 6d. per ton.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Sept.* 7.

Prices of tar products remain generally unchanged. Pitch is still 40s. to 42s. 6d. per ton net at makers' works, with slightly more business available.

Creosote also seems to remain steady, at about 6¼d. net per gallon in bulk.

The values of benzole, toluole, and solvent naphtha are slightly higher; being about 1s. 8½d. net per gallon for benzole, and 1s. 9d. net per gallon for the best quality 95/160 solvent naphtha.

Pyridine bases are firm at about 20s. net per gallon.

Tar Products in the Provinces.

Sept. 7.

The markets for tar products remain unchanged, and there is little or no business to record.

The pitch market is rather easier. A fair amount of business is reported to have been done on the Continent at figures varying from 38s. to 38s. 6d. a ton f.o.b.

The creosote market is quiet; but the tone is good, and it is confidently believed that before very long there will be a renewal of the demand for export.

Carbolic, cresylic, and naphthalene are still difficult of sale. Apparently all these articles are suffering from over-production.

The average values for gas-works products during last week were: Gas-works coal-tar, 25s. to 30s. Pitch, East Coast, 37s. 6d. to 38s. 6d. f.o.b. West Coast—Manchester, 32s. 6d. to 33s. 6d.; Liverpool, 33s. 6d. to 34s. 6d. Clyde, 36s. 6d. to 37s. 6d. Benzole, 90 p.c., North, 1s. 7½d. to 1s. 8½d.; crude, 65 p.c., at 120° C., 1s. to 1s. 1d., naked at makers' works; 50-90 p.c., naked, North, 1s. 7½d. to 1s. 8½d. Toluole, naked, North, 1s. 6½d. to 1s. 7½d., nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8½d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 6d. Heavy naphtha, North, 1s. to 1s. 2d. Creosote, in bulk, North, liquid, 5⅝d. to 5⅞d.; salty, 5½d. to 5¾d.; Scotland, 5⅜d. to 5⅝d. Heavy oils, in bulk, North, 6¼d. to 6¾d. Carbolic acid, 1s. 4d. to 1s. 5d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.c., purely nominal; "B" quality unsaleable.

The Directors of the Dundalk (Co. Louth) Gas Company have declared dividends of 20s. on the "A" shares, and 15s. on the "B" shares, with income-tax at 4s. 6d. in the pound, being the same as last year.

In connection with a competition promoted by the Leamington Chamber of Trade for the best-dressed business premises, a prize was secured by Mr. R. S. Ramsden, Manager of the Leamington Priors Gas Company.

In order to effect economy, it has been suggested that the Blackburn Electricity Department and the Gas Department should work in conjunction with regard to taking readings of meters. It has been urged that for each department to have a separate staff of collectors is a wasteful system, and one which causes inconvenience to consumers, who have to receive two visits where one would suffice. Mr. P. P. Wheelwright (Electrical Engineer) and Mr. G. P. Mitchell (Gas Engineer) have been authorized to collaborate on the question.

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